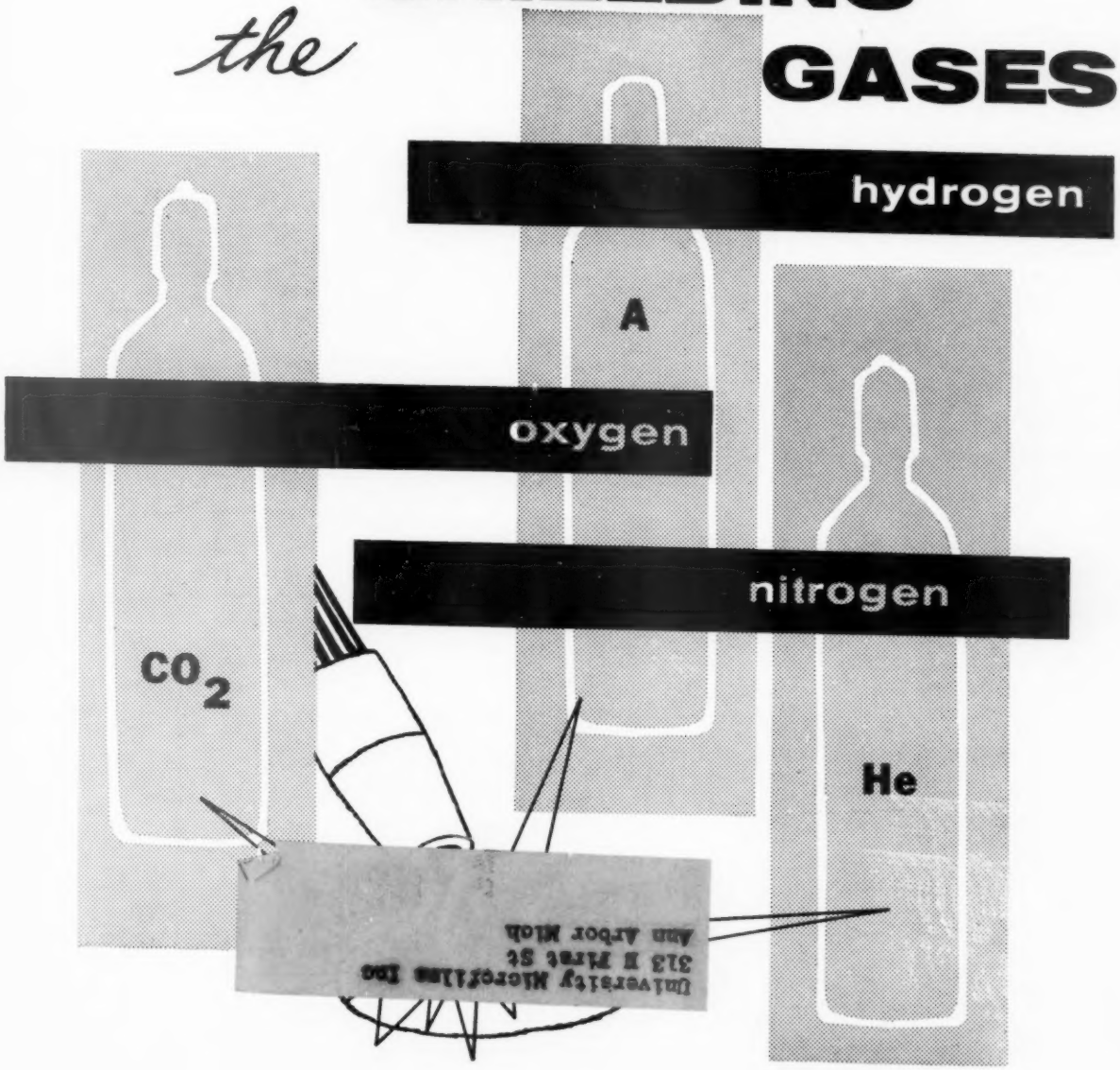
Welding Engineer

AUGUST, 1961
50 Cents

the SHIELDING GASES



University Microfilms Inc
313 N First St
Ann Arbor Mich

Cutting edge in process of being welded. A heavy layer of flux is automatically applied (foreground) to suppress arcing and flashing, and is reclaimed by a vacuum system for re-use.

On heavy-duty buckets at Clark Equipment

ONLY PAGE WELDS HOLD!

At the Construction Machinery Division of Clark Equipment Company, Page A-S-18 welding wire is used to weld cutting edges to bottom plates of buckets for the largest Michigan Tractor Shovels. That's because it was found that welds made with other wires would break unless the steel had been pre-heated. With Page A-S-18, steel can be moved from outdoors storage directly to the welding machine. Even on welds 140 inches long, Page holds every time!

Let PAGE Help Solve Your Welding Problems

Now all Page automatic welding wire is color-coded by grade. The new labeling system simplifies inventory, cuts scrap loss—is another example of Page leadership in action.

From Page, you get over half a century of wire drawing experience and research—and from industry's widest selection of welding wire analyses, Page can furnish the right wire for your requirements. Every modern type of packaging is available. Prompt delivery is assured by a coast-to-coast network of Page distributors and warehouses. Bring your welding problems to Page—we'll be glad to help you improve your quality and lower your production costs.

Write us at Monessen, Pa. for information on the complete Page line of welding wire. Ask for Folders DH-402 and DH-1218.

PAGE
PAGE

WELDING WIRE

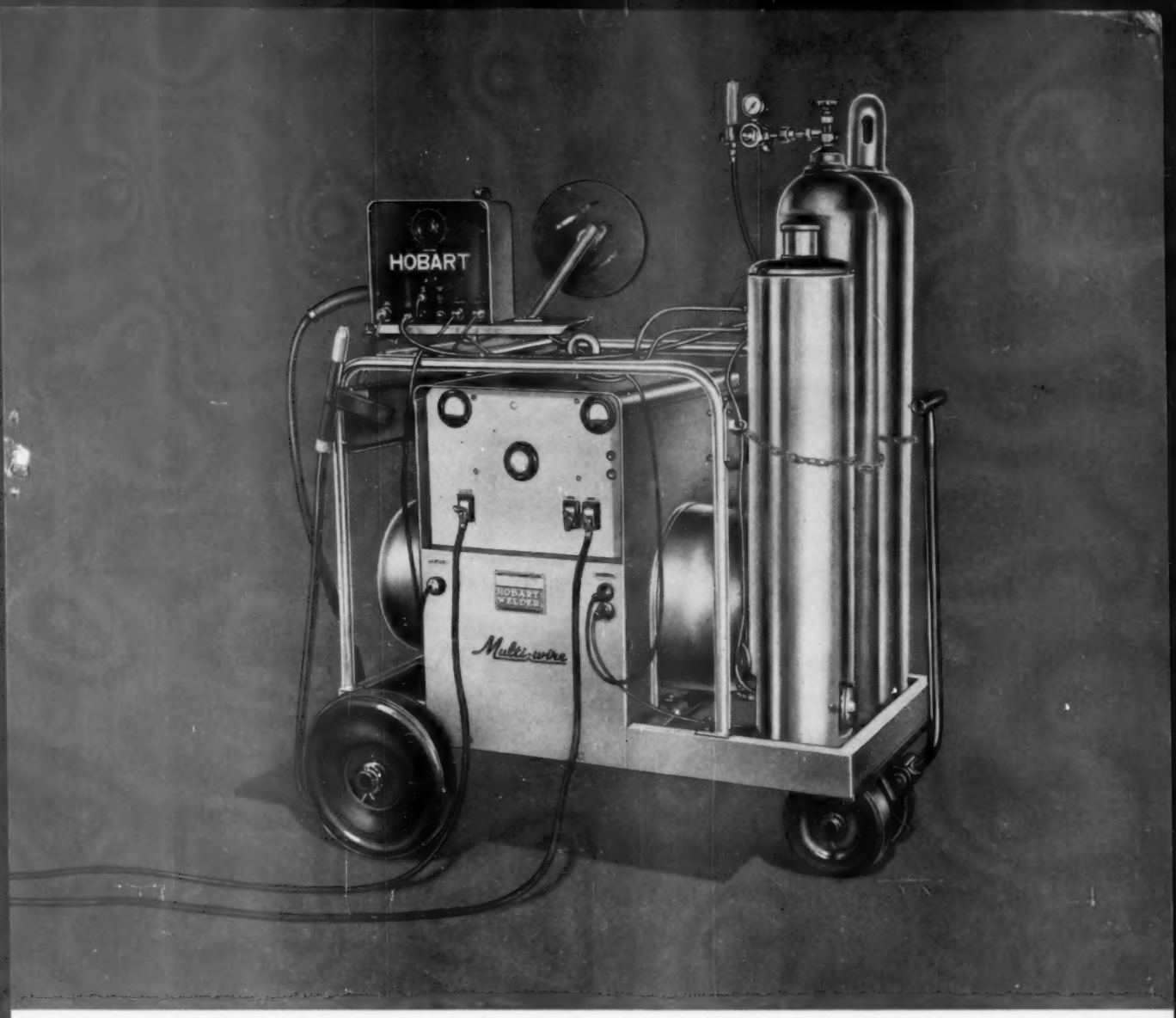
Page Steel and Wire Division • American Chain & Cable Company, Inc.

Monessen, Pa.*, Atlanta, Chicago*, Denver*, Detroit, Houston*, Los Angeles*, New York, Philadelphia*, Portland, Ore., San Francisco*, Bridgeport, Conn. **Indicates PAGE warehouse stocks*

ACCO

—the source for answers to welding problems

For more facts Circle No. 150 on Welding Info-Aid Card



Model PKMC-5

Multi-wire THE NEW WELDER

THAT HANDLES ALL SEMI-AUTOMATIC PROCESSES

Welds carbon steel, stainless, aluminum and many other non-ferrous alloys with the proper selection of easily interchangeable components.

- MICRO-WIRE process for use with gas-shielded small diameter wire—all position.
- MIG-CO_2 for use with large diameter wire at high deposition rates, low cost CO_2 gas.
- FABCO process for high quality high deposition rates using low cost CO_2 gas and tubular wire.
- MIG-ARGON process (and other inert gases) for aluminum welding in all positions.
- SUBMERGED ARC for high deposition rates, high quality, on flat position work.
- OPEN ARC for hardsurfacing by using fabricated wire without shielding gases.

HOBART WELDERS · ELECTRODES

This welder is years ahead in concept and design and offers exceptional cost cutting advantages in **one complete package.** Write for details.

HOBART BROTHERS COMPANY, BOX U-81, TROY, OHIO—Phone FE 2-1223

Manufacturers of the world's most complete line of arc welding equipment

International Sales, Hobart Brothers A.G., Box 5500, Nassau, Bahamas

For more facts Circle No. 151 on Welding Info-Aid Card

HOBART
hi-speed
ROCKET 24, ROCKET 27
iron powder electrodes

ROCKET 24 and 27 ELECTRODES give you

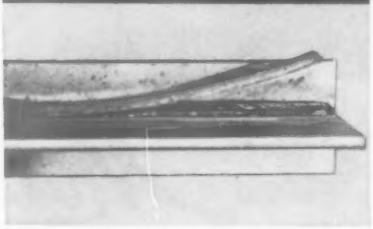
- *High deposition rates*
- *Easy arc control*
- *Excellent mechanical properties*
- *High amperage welding*
- *Easy slag removal*
- *More inches of weld per electrode*

PRACTICALLY DOUBLE
WELD DEPOSITION *over ordinary mild steel electrodes and greatly reduce your welding costs*

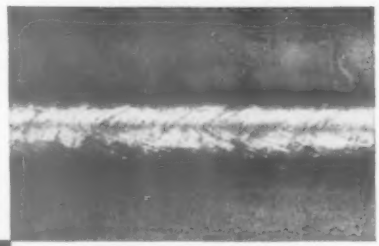
Compare these iron powder electrodes with ordinary mild steel electrodes. See how much easier it is to strike and hold the arc, how smoothly they flow with a minimum of spatter, and how easy they are to handle in all positions.

Operators like the way they can be used with either the free arc or fast drag techniques . . . how the slag practically removes itself . . . how the finely rippled bead bears a striking resemblance to one produced by submerged arc welding.

You'll especially like the radically increased welding speeds Hobart Rocket electrodes permit. Try them.



SELF REMOVING SLAG



SMOOTH, FLAT TO SLIGHTLY CONCAVE BEAD

HOBART ROCKET 24 (E-6024, E-7024) Here is an outstanding electrode for flat and horizontal welding. About 50% of the iron powder in its coating becomes a part of deposited metal, keeps spatter to a minimum, and stabilizes the arc. It works smoothly with a drag or short arc technique.

HOBART ROCKET 27 (E-6027) High tensile strength, yield point, elongation and deep groove capability are the excellent characteristics you get with the Rocket 27. Its 50% iron powder, iron oxide coating produces smooth flowing, low spattering welds. Heavy slag is easily removed. Often replaces E-6020 type.

HOBART BROTHERS COMPANY, BOX U-811, TROY, OHIO, PH. FE 2-1223
"Manufacturers of the world's most complete line of arc welding equipment"

HOBART BROTHERS COMPANY, BOX U-811, TROY, OHIO

☐ Tell us more about Hobart ☐ Rocket 24 and ☐ 27 electrodes

☐ Would like to try sample for use on_____

Name_____

Address_____

City_____ Zone____ State_____

☐ Send complete catalog on all types of welding electrodes.

Mail coupon today for complete details

HOBART WELDERS · ELECTRODES

IT TAKES ONLY A FEW MINUTES *to realize the advantages of Rocket 24 and 27 electrodes. Try and compare them.*

Circle No. 152 on Welding Info-Aid Card

VOL. 46—No. 8

Welding Engineer

THE MAGAZINE OF JOINING AND SEVERING OF MATERIALS

This is welding: August, 1961

Shielding gases — their function in the welding arc 35

Although the space age metals have many desirable properties, they have one notable disadvantage, their affinity for atmospheric elements. One solution to this weld protection problem is a shielding gas. The history, production and function of the three major ones is outlined in this report.
★ (For a reprint of this article, circle 249 on Welding Info-Aid Card.)

Will Mig and Tig meet your needs? 40

Before changing from your present welding method, be sure that the inert-gas shielded welding processes will satisfy your requirements. What these processes can and cannot do is described in this review of Mig and Tig welding by **W. G. Schumacher.**
★ (For a reprint of this article, circle number 250 on Welding Info-Aid Card.)

Miles of CO_2-shielded welds fabricate hopper cars 42

High deposition rates and minimum shrinkage-distortion were the deciding factors in this firm's choice of a carbon dioxide-shielded, flux-cored welding process. Speeds of up to 50 ipm were attained, resulting in more than 3½ miles of welds per day.

Revolving Tig unit cuts costs, but maintains quality 44

Economy without sacrificing high production speeds and top-quality welds was the problem in this Tig application. The solution, as reported by **W. Twity** and **W. Purcell,** centered on revolving the Tig torch instead of the work piece.

Also in this issue:

Weldment-casting design improves riveters 46
Vapor-cooled transformer speeds pipe, tube welding 55
Three miles of runway girders submerged-arc welded 56
Friction welder fills an order 58
Illinois, Oklahoma schools increase welding classes 61
Tape controlled flame-cutter makes debut 62

Regular WE features . . .

August Headlines 7
Your WeldWorld at press time 11
Dateline: Washington 12
Letters 19
Between passes 21
New products for you 22
Editorial: Notable converts 33
Data Sheet No. 252 — Industrial gas data 39
On the job 48
Welding Clinic: Don't overlook dip brazing 50
VIPs in review 67
Book reviews 70
In retrospect 72
The Welding Shopper 73
Literature for your library 74
Welding Info-Aid Card 75
Advertisers' literature 75
Advertisers in this issue 76

WELDING ENGINEER is published monthly with an additional directory number in June by Welding Engineer Publications, Inc. Publication office: 600 S. Seventh St., Rochelle, Ill. ©1961 by Welding Engineer Publications, Inc. Executive, editorial and advertising offices: 5826 Dempster St., Morton Grove, Ill. Circulation office: 4050 N. Milwaukee Ave., Chicago 41, Ill. Second class postage paid at Chicago, Ill. and at additional mailing offices. Subscriptions: U. S. and possessions, $3 per year.
Postmaster: Please send form 3579 to Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

new

Cylinder Catalog

FREE TO YOU

The new Hackney cylinder catalog is now off the press. It's the most complete data file of its kind on modern cylinders for compressed gases, such as oxygen, nitrogen, argon, carbon dioxide, etc.

The catalog describes and illustrates the wide variety of Hackney quality cylinders. A detailed description of the well-known Hackney manufacturing process, plus special engineering data to help you select the right cylinders, makes this catalog your best ordering guide. Use the coupon below to order your free copy.

Pressed Steel Tank Company
Manufacturer of Hackney Products
1456 South 66th Street, Milwaukee 14, Wisconsin

Hackney MILWAUKEE
DOWNINGTOWN IRON WORKS

CONTAINERS AND PRESSURE VESSELS FOR GASES, LIQUIDS AND SOLIDS

Pressed Steel Tank Company
1456 S. 66th St.
Milwaukee 14, Wis.

Gentlemen: Please send me a free copy of the NEW Hackney cylinder catalog.

Name.....*Title*.....
Firm.....
Address.....
City.....*Zone*....*State*.....

Welding Engineer

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

•

WELDING ENGINEER PUBLICATIONS, INC.
P.O. Box 28
Morton Grove, Ill.
Telephones:
YOrktown 5-5130, IRving 8-3355

■

TED B. JEFFERSON
Publisher

■

FELIX T. TANCULA
Editor

■

G. J. CANNIZZO
Managing Editor

•

STUART KAMINSKY
Associate Editor

•

DON JEFFERSON
Art Director

•

LARSTON D. FARRAR
Washington, D. C., Editor

•

ROBERT M. DAVIS
Production

•

LLOYD GOSSMAN
Circulation
JIM BREWSTER
Circulation Promotion

•

HERMAN C. PHELPS
Vice President
Eastern District Manager
P.O. Box 128, White Plains, N. Y.
Telephone: WHite Plains 9-3876

•

TED B. JEFFERSON
Midwest District
P.O. Box 28
Morton Grove, Ill.
Telephones:
YOrktown 5-5130, IRving 8-3355

•

MEMBER
AMERICAN WELDING SOCIETY
INTERNATIONAL ACETYLENE ASSOCIATION
COMPRESSED GAS ASSOCIATION
NATIONAL WELDING SUPPLY ASSOCIATION
BUSINESS PUBLICATIONS
AUDIT OF CIRCULATION

•

Single copies 50 cents. Subscription rates: United States and possessions $3 per year; $5 for two years; $7 for three years. Canada $5 per year; $8 for two years; $10 for three years. All other countries $15 per year; $25 for two years; $30 for three years. Position and company affiliation must be indicated on subscription form. Allow one month for change of address.

WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

It's new!

INSTALLS WITH JUST A HAMMER!

The best electrical connection in the shortest possible time!

YES, with "BERNARD" Connectors, a hammer is the only tool you need to make a perfect welding or power cable connection every time. "BERNARD" Connectors eliminate all special crimping tools, wrenches and soldering. A few blows on the *Self-Contained Impact Punch* form the cable and connector into virtually one solid unit — assuring greater pull-out strength and higher electrical conductance.

Inexpensive "BERNARD" Connectors are available in both Lugs and Splicers in a full range of sizes from 6 through 1 and 1/0 through 4/0. They feature large, easy to read cable size markings and a handy stripping gauge stamped on each connector.

SEND FOR BULLETIN 102

PIONEER FOR BERNARD MODERN WELDING

"BERNARD" CABLE CONNECTORS

BERNARD WELDING EQUIPMENT CO.

10232 Avenue N, Dept. WE, Chicago 17, Ill.

For more facts Circle No. 154 on Welding Info-Aid Card

VICTOR

New gaugeless regulators

Available in VGS Single-Stage or VGT Two-Stage Models

1. *Delivery pressure adjustment*
- —Simple and easy to adjust
- —Readable on two sides
- —Bold pressure readings stamped in cap
- —Bright, easy-to-read pressure indicator

2. Inlet pressure indicator
- —Enclosed and protected piston-type
- —Clearly marked Full to Empty scale stamped permanently into metal
- —Reliable 'O' Ring Seal

3. Listed under Reexamination Service of Underwriters' Laboratories, Inc.

The VGS400 series single-stage and VGT400 series two-stage regulators embody all of the time-tested and field-proved design characteristics that have made VICTOR Safety Regulators the choice of the man on the job. The use of pressure indicators instead of pressure gauges provides increased service for hard usage applications. Order from your Victor dealer.

Single-Stage Models		Two-stage Models	
VGS430-967	0-100 psig	VGT430-967	0-100 psig
VGS410-970	0-15 psig	VGT410-970	0-15 psig

VICTOR for regulators

VICTOR EQUIPMENT COMPANY

San Francisco, California
Los Angeles, California, Chicago, Illinois

MFRS. OF HIGH PRESSURE AND LARGE VOLUME GAS REGULATORS; WELDING & CUTTING EQUIPMENT; HARDFACING RODS; BLASTING NOZZLES; COBALT & TUNGSTEN CASTINGS; STRAIGHT-LINE AND SHAPE CUTTING MACHINES; ROLLER AND IDLER REBUILDING MACHINES

For more facts Circle No. 155 on Welding Info-Aid Card

August Headlines

E. A. Hobart, at right, president of Hobart Bros. Co., presents two-year graduate fellowship to Roy B. McCauley, chairman of the Welding Engineering Department at Ohio State University.

Hobart awards fellowship to Ohio State University

A two-year welding engineering graduate fellowship has been presented to Ohio State University by Hobart Bros. Co., Troy, Ohio.

The fellowship, which will amount to $1,800 per year, will enable a qualified young man to obtain his Masters Degree. The recipient will be responsible for fundamental research activity in welding and will do some teaching.

The purpose of the fellowship is fourfold:

1 — To add to the fund of welding knowledge by furthering fundamental research.

2 — To provide an opportunity for a qualified student to do advanced study.

3 — To attract and assist a capable man to enter the welding industry.

4 — To aid Ohio State University's Department of Welding Engineering.

Hobart will offer the student the opportunity to work in their plant during the summer between the two-year programs.

Hobart holds summit meeting for distributors

Approximately 100 top distributors from all over the United States and Canada attended the recent three-day summit meeting held by Hobart Bros. Co., Troy, Ohio.

An award was presented at the meeting to the Roy Smith Co., Detroit, for being the top volume distributor for 1960.

Wartman Welding Supply, Kokomo, Ind., received first place honors for top quota in 1960 and in the special Micro Wire competition, McDonald & Wilson, St. Louis, finished in first place.

At the meeting, top welding authorities, including T. B. Jefferson, publisher of WELDING ENGINEER, gave talks on their outlook on the future of arc welding.

Airco builds air separation plant at Johnstown, Pa.

A 60-ft-high air separation column was installed recently as part of the steel industry's largest single-column liquid oxygen plant presently under construction by Air Reduction Sales Co. at Johnstown, Pa.

The 675-ton-a-day air separation plant will supply oxygen by pipeline to the Bethlehem Steel Co. blast furnaces in the area.

U.S. Steel gets contract for Notre Dame library

American Bridge Div. of United States Steel Corp. has been awarded a contract to fabricate and erect the structural framework for the new $8 million library at the University of Notre Dame.

All column splices for the 13-story steel structure, in addition to most of the wind connections to column webs, will be welded. Watch WELDING ENGINEER for an article on this project in a future issue.

Tig welded rails

HANDRAILS and tubing of this circular staircase at the Brookings Institution Center for Advanced Study, Washington, D. C., are Tig welded stainless steel. Type 304 stainless steel of more than 100-ft lengths was produced for the railing by Allegheny Ludlum Steel Corp., Pittsburgh.

Chicago AWS Section plans lecture series

The Fourth Annual Lecture Series sponsored by the Chicago section of the American Welding Society will be held at the "Dome," Chicago Bridge and Iron Co., 1305 W. 105th St., Chicago.

The series subject will be "Welding Processes." Lectures will be held from 7-9 p.m.

Lectures will be: Sept. 21, "Manual Metal Arc," by W. B. Blackburn; Sept. 28, "Metal Cutting," by W. K. Johnson; Oct. 5, "Brazing," by J. F. Rudy; and Oct. 12 & 19, "Submerged Arc," by W. B. Root and L. J. Christensen.

Further information can be obtained from E. Hemzy Crane Co., 4100 S. Kedzie Ave., Chicago, Ill.

3rd Southeastern Plant Show set for Greensboro

The 3rd Southeastern Plant Engineering and Maintenance Show will be held in the Memorial Coliseum, Greensboro, N. C., Sept. 12 to 14.

Included in the list of exhibitors are: Alloy Rods Co., York, Pa.; American-Pullmax Co., Inc., Chicago; Arcair Co., Lancaster, Ohio; Fenway Machine Co., Inc., Philadelphia; General Electric Co., Charlotte, N. C.; and Johns-Manville Sales Corp., Atlanta.

Other exhibitors will be: The Marindus Co., Inc., New York City; Milwaukee Electric Tool Corp., Milwaukee; National Welders Supply Co., Inc., Charlotte; Southern Oxygen Co., Greensboro; and Sylvania Electric Products, Inc., Charlotte.

Picker opens new headquarters

PICKER X-Ray Corp. has opened these new headquarters at 1275 Mamaroneck Ave. in White Plains, N.Y. The air-conditioned structure contains 47,000 sq ft of floor space. The building houses about 150 executives and staff personnel and contains a classroom for 100, an employee dining room, offices and demonstration facilities.

Lincoln helps Vo-Ag teachers to give instruction

The Lincoln Electric Co., Cleveland, is entering its sixth year of helping Vocational - Agriculture teachers to instruct local adults in maintenance and repair arc welding.

Over 4,000 schools and 70,000 adults have participated in the program in the past five years.

AWS Fall Meeting set for Dallas

The latest technological developments in welding will be explored by scientists and engineers in a series of papers to be delivered at the Fall Meeting of the American Welding Society at the Hotel Adolphus, Dallas, Sept. 25-28.

Nearly 50 papers and seminars in 16 sessions will be presented to help solve the problem of duplicate research and to make available research data from laboratory projects.

COMING EVENTS

SEPT. 12-14: 3rd Annual Southeastern Maintenance and Engineering Show, Greensboro War Memorial, Greensboro, N.C.

SEPT. 14-15: NWSA Central Zone Meeting, Palmer House, Chicago.

SEPT. 18-10: NWSA Eastern Zone Meeting, Hotel Roosevelt, New York City.

SEPT. 18-22: Summer Conference Course on X-Ray and Radioisotope Nondestructive Test Techniques, The Ohio State University, Columbus, Ohio.

SEPT. 20-22: AEC Welding Forum — Annual Meeting, Southwest Research Institute, Granada Hotel, San Antonio, Texas.

SEPT. 25-28: Fall Meeting, American Welding Society, Adolphus Hotel, Dallas, Texas.

OCT. 9-10: NWSA West Central Zone Meeting, Radisson Hotel, Minneapolis.

OCT. 12-13: NWSA Western Zone Meeting, Riviera Hotel, Las Vegas, Nev.

OCT. 16-20: National Safety Congress and Annual National Safety Council Convention, Chicago.

OCT. 23-25: Fall Meeting, Abrasive Grain Association, Waldorf-Astoria Hotel, New York City.

OCT. 23-27: 43rd National Metal Congress, American Society for Metals, Cobo Hall, Detroit.

Tec Torch moves to new site

TEC Torch Co., Inc., has moved to this new location at 153 Union Ave., East Rutherford, N. J., from its old Carlstadt, N. J., site.

A. O. Smith moves West Coast office

A. O. Smith Corp., Milwaukee, has moved its regional sales headquarters for the Welding Products Div. and Electric Motor Div. from Newark, Calif., to the Pacific Building, 610 16th St., Oakland, Calif.

A. R. Schneller heads the regional welding products division. W. A. Joubert heads the electric motor division.

(More news on page 63)

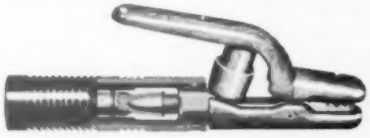
Jackson ST Holders

for trouble-free connections

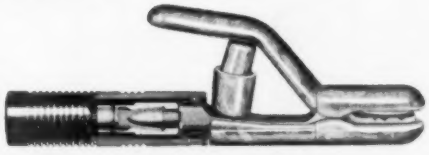
These copper alloy quality Jackson electrode holders have a permanent-type cable connection device good for the life of the cable. It grips the cable jacket as well as the cable, sealing out moisture and dirt. The jacket can't slip back, the strands won't flex and break. The 'stinger end' of the holder can be replaced repeatedly without remaking the connection.

These ST holders are attached to the cable in a simple mechanical way, but the result is an almost fused connection having excellent conductivity.

Get the utmost in conductivity, ease of connection, and long life. Get lower holder costs when buying ST holder stinger end replacements. Get a Jackson Sealed Tight holder in your hands soon and you'll *see* why they're better.



Model ST-3, copper alloy holder for electrodes through ¼" dia. Rated for 300 amps.



Model ST-5 copper alloy holder for electrodes through ⅜" dia. Rated for 500 amps.

Sold Everywhere by Better Welding Supply Dealers.

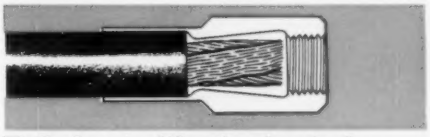
Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

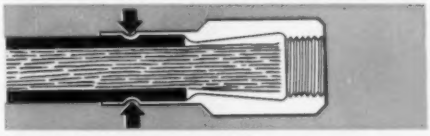
5523 Nine Mile Road, Warren, Michigan

■ ***Strip back the cable jacket—***

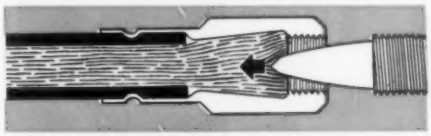
■ ***Slide on the connection nut—***



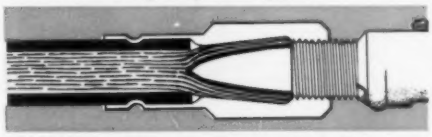
■ ***Seal nut with crimping tool—***



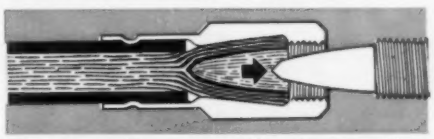
■ ***Push holder stud into strands—***



■ ***Wrench tightly into place—***



■ ***Holder end may be replaced—***

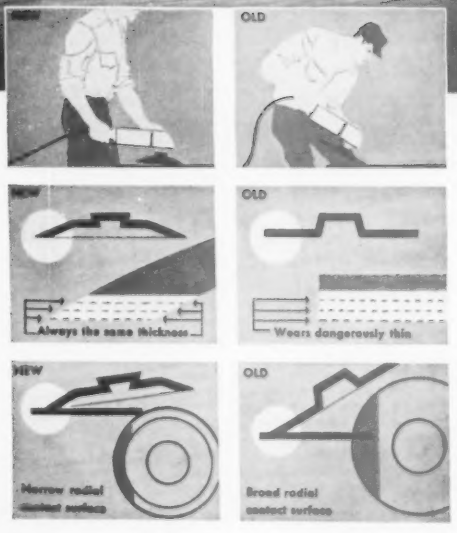


■ ***Connection assembly stays put!***

For more facts Circle No. 156 on Welding Info-Aid Card

NOW LONGER WHEEL LIFE
with new U-grade "KOOLIE HAT"

Now there are *two* "Koolie Hat" wheel formulations ... the tremendously successful R-grade for standard grinders and standard grinding jobs . . . and the brand new U-grade for up to 30% longer life on all materials. Designed specially for maximum effectiveness on high-speed, air-driven or electric portable grinders that operate at 5200 r. p. m. or more, Bay State's U-grade "Koolie Hat" wheel gives you the same speed, ease of operation and safety as R-grade . . . *plus* longer life on all materials.



◀ *Easier Operation* Koolie Hat wheel is held at 4° to 5° angle instead of 25° to 30°, requires less pressure, virtually eliminates jitter and bounce. Operator's position is much more relaxed.

◀ *Extra Safety* Koolie Hat shape wears evenly over all three abrasive layers instead of one at a time. Less danger of shattering due to heat cracks or thinning of wheel.

◀ *More uniform speed* Narrow radial contact surface between wheel and work keeps speed high for fast, efficient metal removal without heat build-up.

Get full details on the new U-grade "Koolie Hat" wheel from your Bay State distributor or factory representative *now. Better grinding at lower cost . . . that is their business.*

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Chicago, Cleveland, Detroit, Los Angeles, Pittsburgh. *Distributors:* All principal cities.

For more facts Circle No. 157 on Welding Info-Aid Card

Your August, 1961 *Weld World*

As WE went to press, these were the industry's latest developments:

. . Formal agreement by which Air Reduction Co., Inc., acquired assets and business of Speer Carbon Co. was signed early last month. Special meeting of Speer stockholders will be held Aug. 15. If they approve, one share of Airco common stock will be exchanged for each 2.25 shares of Speer stock. Speer will continue to be operated by its present management.

. . American Cryogenics, Inc., has gathered another firm to its corporate bosom. Independent Engineering Co., O'Fallon, Ill., is the latest acquisition of the firm which numbers among its properties Coyne Cylinder Co. and Marks Oxygen Co. Officers of American Cryogenics feel that this latest move rounds out its line in the compressed gas industry

. . Tracerlab, Inc., and Laboratory for Electronics, Inc., recently announced plans to merge. The latter would be the surviving company and would issue one share of LFE common in exchange for each 4.5 shares of Tracerlab common.

. . U. S. Steel's National Tube Div., has entered the structural field with the announcement that square and rectangular hollow tubing rolled to ASTM and AISC specifications is now available. With weight-saving factors of tubular sections properly utilized, a building can be erected which is 30% to 40% lighter than, but just as strong as, one built with conventional structural sections.

. . The American Welding Society has given permission to a committee representing the society to organize a one-day technical session devoted to the new processes and to CO_2 shielded welding to be held during the annual ASM Metal Congress and Show in Detroit next October. AWS, however, is not co-sponsoring the annual affair in any way, according to National Secretary Fred Plummer.

. . Some producers of bronze welding rod have dropped prices as much as 15 cents per pound in a drastic move to meet foreign competition.

. . Despite earlier hopes that steel and aluminum prices would hold, it now appears that a hike will be forthcoming—if not this fall, then next year. Some steel prices (rebar, line pipe, casing, etc.) have actually gone down since last year, but sheets, plates and structurals are likely candidates for increases. Labor costs go up Oct. 1 in steel and went up Aug. 1 in aluminum.

DATELINE: *Washington*

Production, employment, stocks or federal assistance, no matter which barometer you use to measure the nation's economic status, business in general seems to be in an uptrend. Items:

¶ Industrial production has increased sharply in the past two months, enough to regain almost two-thirds of the ground lost in 1960.

¶ Although unemployment in May remained high (66.8 million), this is 400,000 less than a year ago. Authorities generally agree that the rate of unemployment usually lags behind business during recovery periods.

¶ The stock market, although no longer as accurate a reflection of the total economy as it used to be, indicates a trend to caution, especially in the so-called glamour stocks which have fallen far below recent peaks. Part of this is probably due to warnings to small investors by the various exchanges against careless speculation plus the Security & Exchange Commission's proposed investigation of practices. The poor earnings of these stocks after their often exaggerated buildups has not helped either.

Despite assurances by the economists that a new boom is in the making, numerous businessmen are more cautious and foresee only "substantial growth, but not a sharp, runaway boom."

* * *

The federal government continues to give its backing to the small business community through more liberal Small Business Administration loans and through the awarding of more prime contracts.

Total SBA loan approvals have risen each month since February when 302 loans were approved. In March there were 483; in April, 501. May hit a high of 511. From February through April, loans totaling $90.3 million were approved.

More than 1,500 small businesses have also received approximately $60 million in long-term loans and equity financing from the more than 300 Small Business Investment Companies licensed by the SBA.

According to SBA administrator John E. Horne, "The rate of licensing has been stepped up in recent months mostly as a result of eliminating unnecessary and time-consuming procedures." Presently licensed companies now have almost $250 million available for, or already invested in, long-term financing.

At the same time, set-aside prime contracts awarded to small firms increased almost 40%, according to SBA, during April. Small firms received 2,700 prime contracts valued at $107 million, including military and civilian agency awards.

A good example: in the first three quarters of fiscal 1961, 95% of the Navy's Bureau of Yards and Docks contracts were awarded to small firms. This was 78.4% of their value of $95.8 million. SBA defines a small firm in the construction industry as one which, with its affiliates, has average annual receipts of $5 million or less for the past three years.

* * *

Recently, Assistant Commerce Secretary Hickman Price, Jr., hinted at a program to guarantee private loans, patterned on FHA methods, to middle-sized companies. Without defining middle-sized, he told a meeting of biscuit manufacturers of the government's already announced plans to stimulate investments, then added:

"How much greater would this be, if still additional funds, in the form of readily granted credit, were also made available? To this end, we in the Department of Commerce, and other government agencies, are studying a program for stimulating private credit lending for modernization and expansion investment."

Send for new movie,

"How to Weld USS 'T-1' Steels"

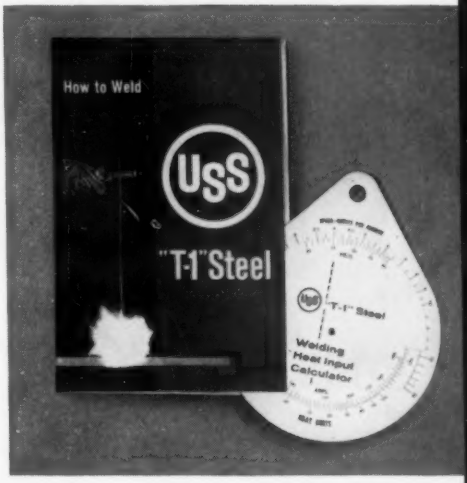
This mark tells you a product is made of modern, dependable Steel.

This new 18-minute, 16mm color motion picture shows concisely the practices involved in welding USS "T-1" Steels. If you are fabricating "T-1" Steel in your shop, this film and copies of the booklet will be a big help in demonstrating the proper technique to your welders. Fill out the coupon below and indicate the number of booklets you will need.

Included in the booklet is a handy welding heat-input calculator that helps a welder choose the proper welding machine settings. The film, together with the booklet, will help every welder to weld USS "T-1" Steels readily and successfully.

We'll gladly lend you the film and furnish enough free copies of the booklet and heat-input calculator for your shop personnel. USS and "T-1" are registered trademarks.

United States Steel Corporation • Columbia-Geneva Steel Division
National Tube Division • Tennessee Coal and Iron Division • United
States Steel Supply Division • United States Steel Export Company



United States Steel
525 William Penn Place, Room 6355
Pittsburgh 30, Pennsylvania

Gentlemen:

Please lend me your 16mm color, sound movie, "How to Weld USS 'T-1' Steels."
Also, send me_____booklets of the same title. I understand there is no obligation.

Name_____

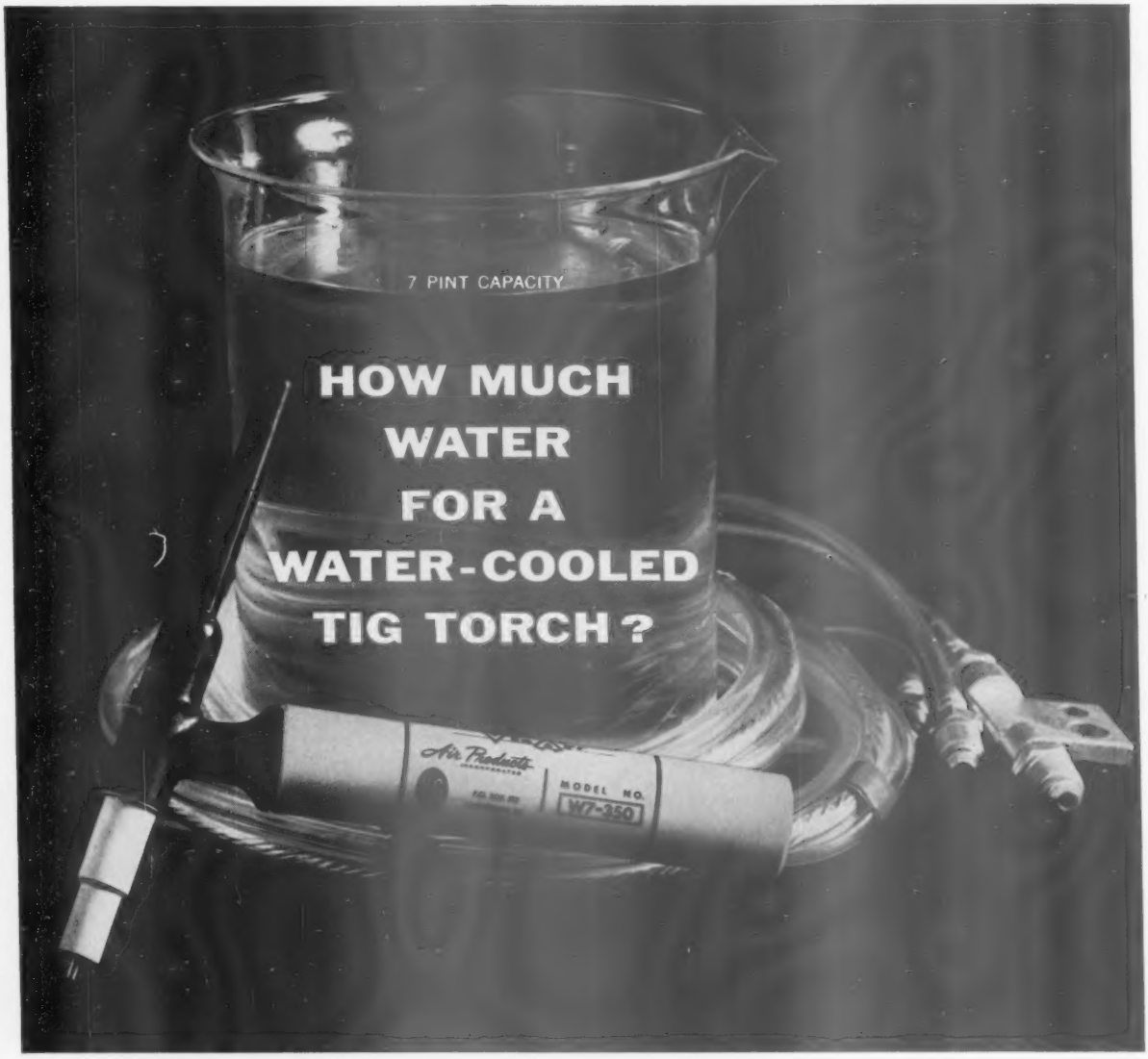
Title_____

Company_____

Address_____

City_____ **Zone**____ **State**_____

United States Steel



THIS KG VisArc® TORCH PUTS 3½ TIMES AS MUCH COOLING WATER THROUGH THE HEAD EVERY MINUTE

Most quality torches circulate only 2 pints of water every minute; KG Vis Arc circulates 7 pints. You get an added increase in cooling efficiency, a greater margin of safety—and you get it at low cost. Next time you order, see your distributor's complete line of KG Vis Arc TIG welding equipment, from 50 to 500 AMPS—highest quality at lowest cost.

FOR INFORMATION OR SERVICE, CONTACT YOUR LOCAL WELDING SUPPLY DISTRIBUTOR OR

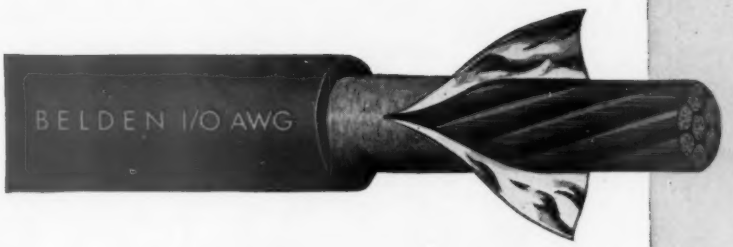
Air Products ...INCORPORATED
KG WELDING AND CUTTING EQUIPMENT

GENERAL OFFICES ALLENTOWN, PA.

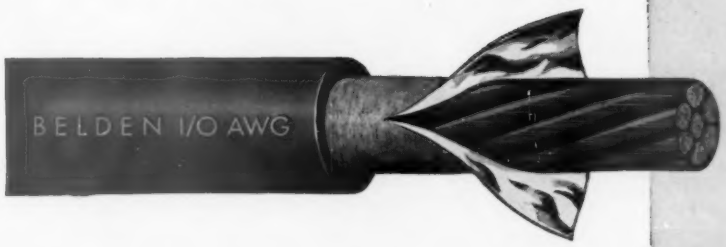
DISTRICT OFFICES: ISELIN, N. J. • EDGEWOOD, MD. • GRANITE CITY, ILL. • PHILADELPHIA, PA. • LONG ISLAND CITY, N. Y. • SOUTH BEND, IND. CHICAGO, ILL. • CREIGHTON, PA. • PARKERSBURG, W. VA. • CLEVELAND, OHIO • LOS ANGELES, CALIF. • MINNEAPOLIS, MINN. • KANSAS CITY, MO.

For more facts Circle No. 158 on Welding Info-Aid Card

Belden Welding Cable
the Complete Line

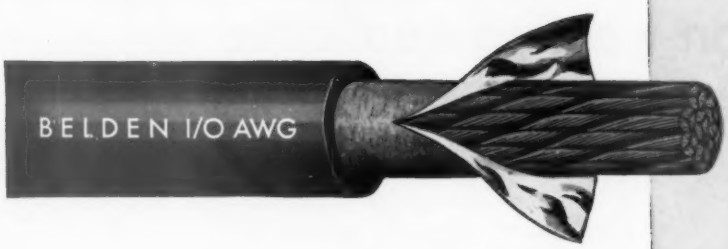


O.T.R. Rubber-Jacketed Cables
Oil-tempered rubber gives the best balance between easy handling, flexibility, and resistance to the effects of oil, heat, cold, and mechanical abuse.



Neoprene-Jacketed Cables
Resist oil, grease, heat, sunlight, mechanical abuse, and ozone set up by high frequency welding or atmospheric conditions.

HVF Vinyl Plastic-Jacketed Cables
High voltage-frequency vinyl insulation affords perfect resistance to corona and ozone cracking . . makes this cable ideal for high frequency welding. High resistance to abrasion, oil, and impact.



Whip Lead Cables
Hawser lay construction of conductor makes this cable extremely limp and manageable . . minimizes operator fatigue. Jacket won't pull away from electrode holder. Neoprene insulation.

plus rubber-jacketed welder power supply cords

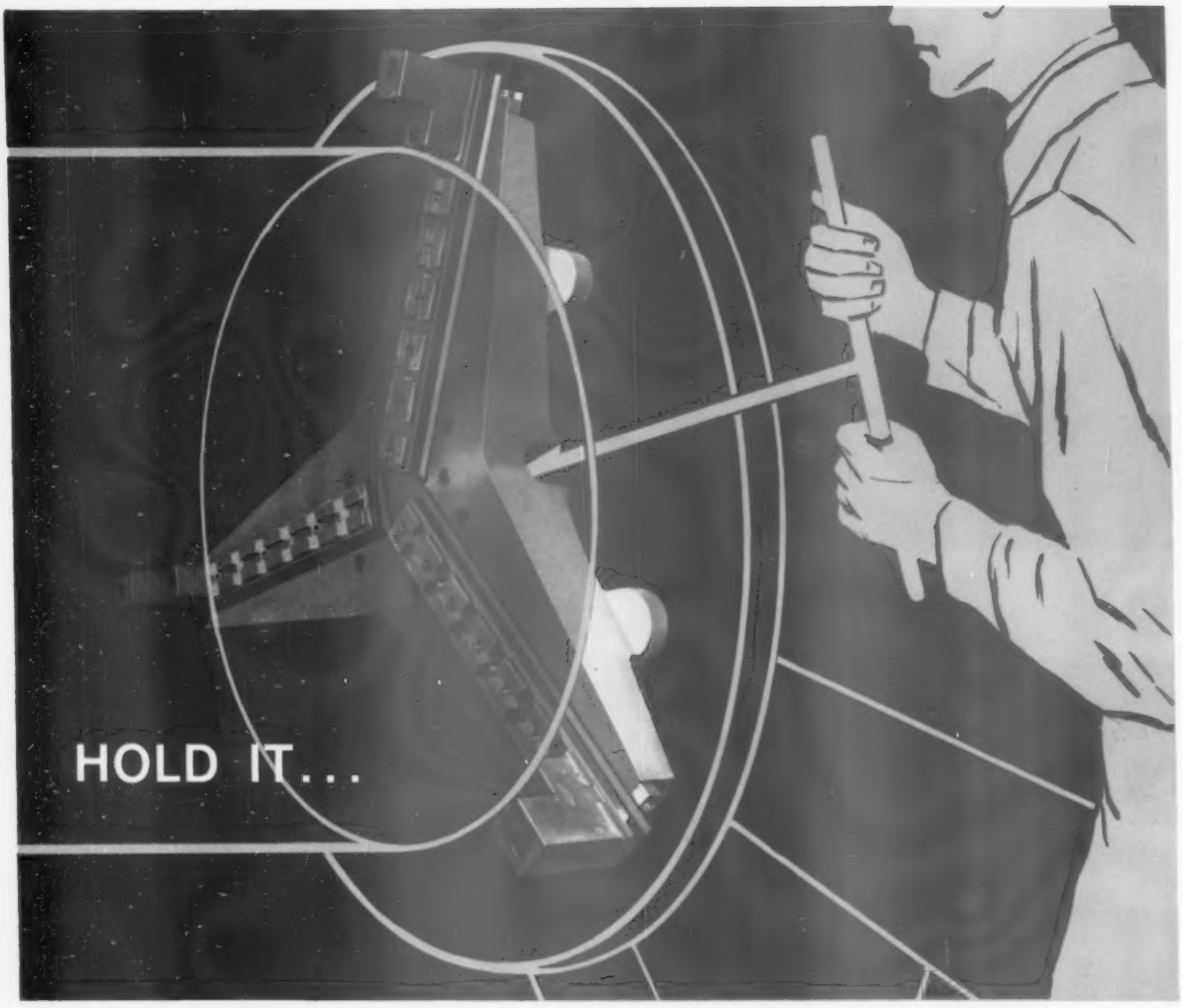
ask your welding supply distributor

one wire source for everything electrical and electronic

magnet wire • lead wire • power supply cords • cord sets • portable cordage • electronic wire • automotive replacement wire and cable • aircraft wire • electrical household replacement cords

Belden
WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

18-1-9



Here's fast accurate work holding for precision welding applications

The Skinner workholder offers these important features:

- Completely sealed for protection against flux, dirt and abrasive materials
- Serrated, hardened steel jaws for rugged service
- Removable and reversible jaws with long bites for stability and safety
- Three equally spaced locations for engaging tightening wrench
- Low maintenance costs for greater job economies.

Skinner's new three-jaw, self-centering workholder mounts on headstocks, turntables, and positioners . . . opens and closes with a turn of the wrench . . . centers workpieces accurately and automatically. The workholder's positive gripping action holds external and internal work surfaces—rigidly positions a variety of sizes and shapes.

Skinner workholders are made in three standard sizes with capacity ranges of 2 to 24 inches, 3 to 40 inches, and 12 to 60 inches. Special jaws can be fitted for special applications. For complete details, address Skinner-Horton Chuck Division, New Britain, Conn.

THE CREST OF QUALITY

SKINNER HORTON CHUCKS

SKINNER-HORTON CHUCK DIVISION
SKINNER PRECISION INDUSTRIES, INC. • NEW BRITAIN, CONNECTICUT, U.S.A.

For more facts Circle No. 159 on Welding Info-Aid Card

For more facts Circle No. 160 on Welding Info-Aid Card →

We are happy to announce the appointment of NCG

as a national distributor of our personal

protective equipment for welding,

brazing and cutting.

Your Surest Protection ... AO SURE-GUARD Products

American Optical

COMPANY

SAFETY PRODUCTS DIVISION

NCG®

We are proud

to announce our appointment

as a national distributor for American

Optical Company of personal protective

equipment for welding, brazing and cutting.

NCG® NATIONAL CYLINDER GAS

Division of CHEMETRON Corporation

Letters

NEMA ratings

I was questioned recently on the procedure used to establish the NEMA rating for welding machines.

I obtained some information on duty cycles which states that the duty cycle is based on a 10 minute period; therefore, a welder with a 60% duty cycle should operate at nameplate rating for 6 minutes of a 10 minute period.

I understood this to mean that a welder rated at 300 amp — 40 volts with a 60% duty cycle should maintain a 300-amp 40-volt arc for a period of 6 minutes without difficulty.

If this assumption is incorrect, would you kindly correct it and inform me where I may obtain additional information?

E. J. McIntosh
New Brunswick Technical Institute
Moncton, New Brunswick, Canada

—Your assumption, with regards to a 300 amp welder, is correct. If the welder is rated at 300 amp — 40 volts, it should operate satisfactorily and without difficulty six out of every ten minutes when it is rated at 60% duty cycle. When used for stick electrodes, very few welders are subjected to duty this severe. Rarely does a weldor working with stick electrodes weld more than 50% of the time. — Ed.

TV Tower

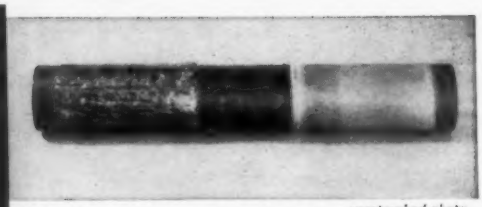
Thanks very much for the excellent story about the Cape Girardeau TV Tower which appears in the May issue. We think it is an excellent treatment of the subject and are most appreciative.

Dan Byrd
Dresser-Ideco Co.
Columbus, Ohio

Letters should be addressed to: The Editor, Welding Engineer, P. O. Box 28, Morton Grove, Ill. No letter will be published unless signed, but your name will be withheld if requested.

How flame spraying can pay for itself in your shop in a very short time

ONE EXAMPLE
Hard facing time cut from 4 hours to 25 minutes



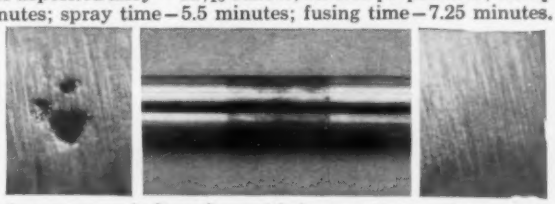
unretouched photo

The two end sections of this shaft have been built up with AMS 4775. Section at left applied by welding — time 4 hours; section at right by flame spraying — time 24 minutes, 45 seconds.

QUESTION: Look at the picture. Which end would you prefer to grind finish?

Here's the whole story. We took a 15" length of 2.5" mild steel shafting and undercut two 5" sections .050" on the radius. We then sent the shaft to a nationally-known job shop with instructions to apply AMS 4775 on the left-hand section, sufficient to finish at 2.5". Weight of welded-on alloy was 17 1/16 ounces — time spent by one of their top men — 4 hours (including preparation).

Then we blasted the second section with steel grit and flame sprayed it with AMS 4775 in powder form (ThermoSpray Powder 15E). The coating was then torch-fused. Weight of deposited alloy — 11 1/16 ounces; surface preparation, set-up and pre-heat — 12 minutes; spray time — 5.5 minutes; fusing time — 7.25 minutes.



unretouched photo, in center, shows finish-ground shaft. Insets, magnified about 50X, show pits in welded section (left) and no pits in flame sprayed section at right.

We then sent the shaft out to a grinding shop with instructions to clean up at 2.500" plus. The flame-sprayed section cleaned up at 2.510" but welded section still showed pits when grinding was stopped at 2.477" Rockwell of welded end Rc-61, sprayed end Rc-60.

Pump plunger being flame sprayed with METCO ThermoSpray® Powder Gun

These flame-sprayed coatings are solid, homogeneous; usually superior to those applied by other methods. You can apply them at high speed, with lower material and finishing costs. In addition to AMS 4775, a number of other powders — including tungsten carbides — are available for various service requirements; all may be fused—some used as sprayed for certain service requirements.

For further information on this high-speed, money-saving, hard-facing process, phone, write or wire.

METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies
1101 Prospect Ave., Westbury, L. I., N.Y. Telephone: Edgewood 4-1300 Cable: METCO
In Great Britain: METCO., Ltd., Chobham-near-Woking, England

FREE BULLETIN

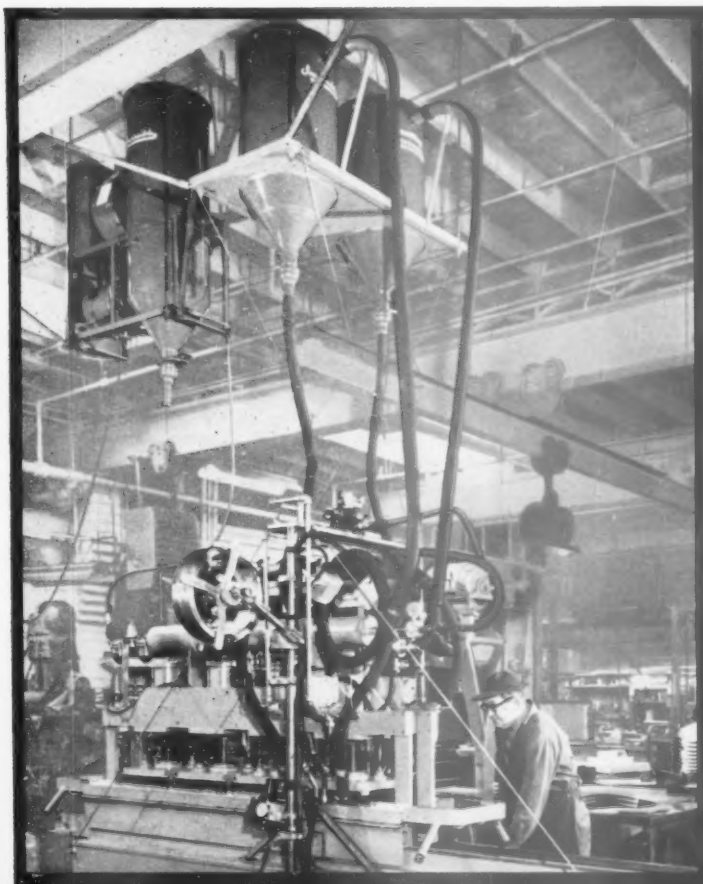
FREE BULLETIN: Send off the coupon for this and other useful information which shows how flame spraying pays for itself—in a very short time. No obligation, of course.

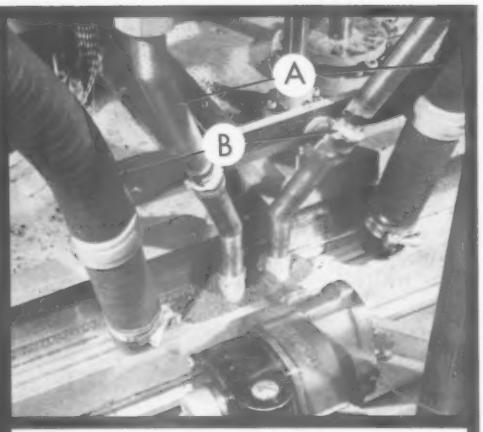
METCO INC.
1127 Prospect Ave., Westbury, L. I., New York

Please send me information on hard-facing by flame spraying.

Name _____
Title _____
Company _____
Address _____
City _____ Zone _____ State _____

For more facts Circle No. 161 on Welding Info-Aid Card

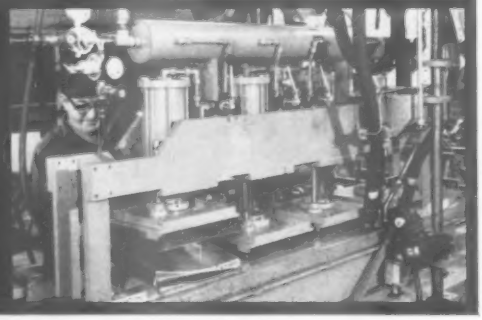




LEFT: Invincible compactness permits space-saving overhead installation. Flux recovery system has two primary separator tanks, one for each welder. Work carriage moves between welders. Heat exchanger sections are welded on both sides simultaneously, and flux is supplied and recovered on both sides.

ABOVE: Tube A feeds flux as Hose A recovers. When pass is completed, welded units are removed and new parts locked in place. These are welded on return pass. Direction of flux flow changes automatically so that Tube B feeds flux and Hose B recovers.

BELOW: Worker is removing a welded section.



INVINCIBLE supplies steady flow of flux...

Production Is Increased 350%

This unique welding machine and the Invincible Flux Recovery System have solved a tough fabrication problem at Henry Furnace Company, Medina, Ohio. Two sides of irregular-shaped heat exchanger sections are now end-welded together simultaneously. Results of the automated operation include:

- **350% production increase**—875 sections can be welded per day as compared with 250 by the hand-welded method.
- **Strong, clean welds**—Invincible automatically supplies a continuous flow of flux to the welders. It recovers unfused flux, cleans it, and recirculates only dust-free flux to the work.

Invincible was chosen because its flexibility and large capacity meet the unusual job requirements. Heat exchanger sections travel between two welders and are welded in one pass of the carriage. These are removed . . . new assemblies are locked in place and welded on the return pass. Invincible supplies an ample flow of flux under all conditions.

There is a cost-cutting Invincible system for *your* submerged arc welding operation. Write us for a free survey. And . . .

Send for Flux Recovery Equipment Folder

INVINCIBLE

vacuum cleaner manufacturing co., Dover, Ohio

Between passes

Abel on Europe

What do welding magazine editors normally ask of someone in the industry who has just returned from Europe? They ask for his impressions of European welding. Being normal, we asked C. Burnell Abel, vice president of Miller Electric Mfg. Co., Inc., Appleton, Wis., who has visited Europe twice in recent months, just that.

Here are portions of his reply:

"Although most of my contacts were with distributors, I did see several items that were quite interesting.

"In Germany I was shown how they fabricated I beams and other structural beams by welding plate together . . . I was given the impression that due to the difference in labor costs in most of the European countries, it was more practical to fabricate items than it was to purchase them. In addition, I understand that beams of this sort are not readily available in many places.

"While I was in Milan, Italy, I visited one factory making refrigerator cases, where considerable stainless steel was used. Most of this was inert-arc welded, and I was quite pleased to see their results. In comparing the finished product with the appearance of an American equivalent, I could see little difference, if any. The welds were good, and the appearance excellent.

"Automatic and semiautomatic welding is gaining in popularity quite rapidly in most of the countries I visited. This is reflected in our own business where we are noticing a considerable increase in the demand for constant-potential units which are designed for these processes. There seems to be absolutely no doubt that most European countries are utilizing welding to a greater degree in certain facets of production than are we. More welding is done, apparently, on such structures as buildings, bridges, etc., than we have been doing up to now, probably because of the restrictions placed upon our contractors by what I consider outmoded testing regulations.

"If you consider advancements in welding techniques, of course, the United States is head and shoulders above the rest of the world. We will undoubtedly continue in this same ratio for a great number of years, but we are providing this same knowledge to our friends in other countries who are eager to accept anything that will enable them to do their job better and more economically."

Abel winds up his observations with this paragraph (emphasis ours):

"What welding I saw was good, and I believe it is typical of the workmen you will find in most of the European countries who take considerable pride in their work. It was my impression that high production in most of the European countries was secondary to quality production."

jack of all trades

Maybe you saw the item in the papers recently about the gentleman who performs a free marriage ceremony with any 5-gallon purchase of gasoline at his Miami filling station. He was quoted as saying, "It's all very legal. I'm a notary public. I also do welding jobs, by the way."

remember

Any government with the power to give you anything you want is strong enough to take everything you have.

did you know . . .

That August 8 is International Character Day? It's sponsored by an organization known as the International Association of Characters (what else?), P. O. Box 65, Phoenix, Arizona.

Tempilstik°

*temperature indicating crayons**

*Also Tempil° Pellets and Tempilaq° (liquid form)

Tempilstik°—a simple and accurate means of determining preheating and stress relieving temperatures in welding operations. Widely used in all heat treating—as well as in hundreds of other heat-dependent processes in industry. Available in 80 different temperature ratings from 113°F to 2500°F . . . $2.00 each.

Send for free sample Tempil° Pellets. State temperature desired . . . Sorry, no sample Tempilstiks°

Most industrial and welding supply houses carry Tempilstiks° . . . if yours does not, write for information to:

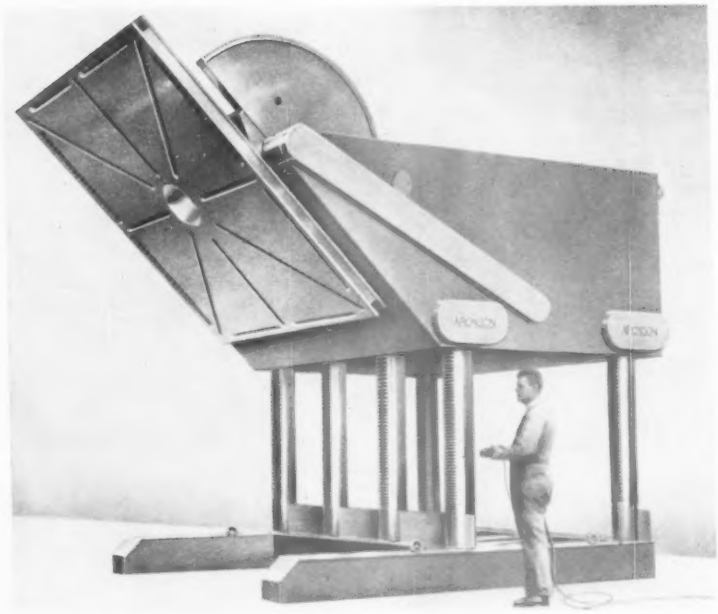
WELDING SALES DIVISION

Tempil° CORPORATION
132 West 22nd St., New York 11, N. Y.

Circle No. 163 on Welding Info-Aid Card

For more information, fold out Welding Info-Aid card on page 75 and circle appropriate numbers as you read.

NEW PRODUCTS for you



60-ton welding positioner features geared elevation

Model GE1200 60-ton welding positioner has 120,000-lb weight capacity with center of gravity of work 12 in. above and off-center of table. Fifty-four inches of geared elevation at 15-ipm will lift full load at 90-deg tilt. All elevator mechanisms including posts are contained inside chassis with nothing above top to obstruct weldment turning. Variable speed table rotation of 0.008 rpm to 0.36 rpm is afforded through 4-speed gearshift transmission. **Aronson Machine Co., Inc.**

Circle No. 1 on Info-Aid Card.

Spot welder designed for small industry work

Welding equipment for use in handicraft and small industry includes a portable 70-lb transformer. Suitable for welding light gage and heavy plate, welder uses both 1 to 4-mm-diameter electrodes and 1.5 to 3.25-mm electrodes. Air-operated spot welding tongs can weld up to 2-mm plates when using short arms and up to 1-mm plate with long arms. Unit can be mounted or hand-operated. **The American-Swedish News Exchange.**

Circle No. 3 on Info-Aid Card.

Electrodes designed for welding, surfacing, cutting

A new line of welding electrodes is now on a full production basis. The first four electrodes are: Manganese-XL, a low hydrogen a-c/d-c 14% manganese-nickel electrode for high-strength welds of dissimilar carbon and alloy steels, shock-resistant build-up and low friction surfacing; Universal Hardface, an all-purpose a-c/d-c electrode for heavy industry and mining; Spray-Rod, an a-c/d-c "spray on" rod for thin-layer hardfacing; and Piercing Electrodes for cutting, gouging, channeling and piercing any metal. **Stulz-Sickles Co.**

Circle No. 4 on Info-Aid Card.

Welder can be used for variety of processes

Multi-Wire combination welder and matched wire feeder can be used for a variety of semiautomatic processes. Welder provides facilities for CO_2 shielded welding, Mig welding of nonferrous metals, fabricated or tubular wire welding without gas shielding, and submerged arc welding. Variety of guns available for each process. To change processes, appropriate gun and cable assembly are attached and appropriate drive rolls and wire guides installed. **Hobart Bros. Co.**

Circle No. 5 on Info-Aid Card.

Silicon-bronze rod suited for Tig, carbon arc

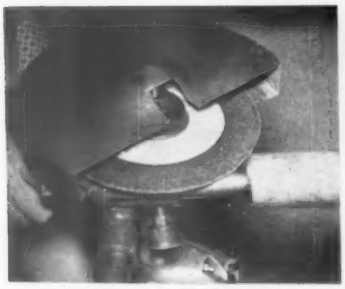
Silicon-bronze welding rod is suitable for use with Tig, carbon arc and oxyacetylene welding. Airco 1010 is used for welding silicon bronze, wrought and cast materials as well as weldable grades of copper and copper alloys. Rods come in 36-in. lengths and 1/16 to 5/16-in. diameters. **Air Reduction Sales Co.**

Circle No. 6 on Info-Aid Card.

Unit cuts, bevels coated pipe with less cutback

Compact design unit cuts and bevels coated pipe with less cutback. Full circle traveling ring cuts and bevels pipe simultaneously. Model 0 handles pipe from 1½ in. to 4 in. Models 1 through 8 handle 4-in. through 48-in. pipe. Adaptors available for conversion to double cutting machines. **Crose-Perrault Equipment Corp.**

Circle No. 7 on Info-Aid Card.



Machine bevels pipe 1½-in. to 24-in. diameter

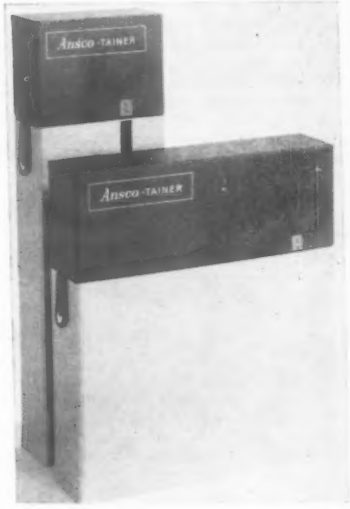
Model 610 pipe beveler bevels small and large pipe sizes from 1½-in. to 24-in. diameter. Will bevel steel, stainless steel, high alloy steel and aluminum. Attachments fit on straight shank grinders, either air or electric. Designed for shop or field, unit is recommended for beveling out-of-round pipe. **Erwin H. Lass**

Circle No. 8 on Info-Aid Card.

Process brazes, solders honeycomb sections

Method for brazing and soldering honeycomb sections uses a non-corrosive flux which eliminates need for atmospheres, vacuum, long heating and cooling cycles. Honeycomb sections of ferrous or non-ferrous metals can be joined with variety of brazing alloys or solders. Process can be rapid and continuous. **Murray Hill Research**

Circle No. 9 on Info-Aid Card.



X-ray film carrier prevents fogging

Darkroom to equipment area X-ray film carrier prevents fogged and crimped edge films. Ansco-Tainer has stain-resistant plastic finish. Each container holds a complete 75-sheet interleaved or 150 sheet non-interleaved pack. For industrial users without a film bin, the container serves as a tabletop container for film. **Ansco Div., General Aniline & Film Corp.**

Circle No. 10 on Info-Aid Card.

MID-STATES *Magna-Tran*

THE FINEST IN INERT GAS WELDING EQUIPMENT

MODEL
MAG 300 AC/DC T1

FINEST IN RECTIFIERS

Hermetically sealed SILICON DIODE rectifiers are used in the MAGNA TRAN to produce the most efficient DC power conversion known. SILICON is fully guaranteed, will NOT age and assures full rated output for life.

MODEL
MAG 300 AC/DC T1

FINEST CONTROL SYSTEM

Exclusive pneumatic timers, simply PLUG IN like radio tubes to provide gas Pre-flow, After-flow, Hi-Frequency Drop Out and Spot Arc control in any combination. Buy timers and plug in as required in the field. Remote Control by either hand or foot control.

FINEST ARC CHARACTERISTICS

New patented saturable shunt design eliminates need for separate reactors or mechanical device and delivers exceptionally stable arc current. On DC SILICON rectifiers produce smoothness you've never thought possible.

FINEST FOR MAINTENANCE

Modular plug in design throughout simplifies any service problem. Hi-Frequency and control components are mounted on removable plug in chassis. Plug in gas-water panel, Silicon rectifiers, line contactor and other parts are easily accessible.

Available in either AC or AC/DC models.

M S

MID-STATES WELDER MFG. CO.

6025 South Ashland Ave. Chicago 36, Ill.

For more facts Circle No. 164 on Welding Info-Aid Card

WELD WITH ARCOS STAINLESS ELECTRODES

Job report courtesy of Southwest Welding & Mfg. Div., Yuba Consolidated Industries, Inc. Alhambra, California

World's largest liquid oxygen tank calls for pioneering in stainless welding. This 75,000 gallon vacuum bottle for liquid oxygen was fabricated from Type 321 stainless. Specifications required strong sound welds having maximum notch toughness at low temperatures. After extensive impact testing at minus 320°F Arcos electrodes, designed for low carbon and specific ferrite ranges, were selected. The precise weld metal properties delivered by Arcos on this job are available for all your stainless welding jobs.

ARCOS

Arcos Corporation • 1500 S. 50th St. • Philadelphia 43, Pa.

Goggle clips hold tight to hats, caps

Clips prevent slipping of goggles from smooth surface of hard hats and caps. Tu-Way Goggle Clips maintain position of goggles whether they are raised or lowered. Elastic head band is inserted into clips without removing it from goggles. Clips are easily attached. **American Industrial Safety Equipment Co.**

Circle No. 11 on Info-Aid Card.

Welding helmet headgear is free-floating unit

Free-floating 3-C welding helmet headgear is not affected by moisture. Plastic headgear is flexible, adjustable for fit around and on user's crown. All metal parts are corrosion-resistant aluminum. **The Fibre-Metal Products Co.**

Circle No. 12 on Info-Aid Card.

Welding, cutting outfit cuts up to 6-in. thick

Included in this welding, cutting outfit is No. 63-F heavy-duty welding torch which takes up to a size 22 tip and has high-temperature silicone O-ring seals. Head-mix-type cutting attachment cuts up to 6 in. and features triangular tube construction. Pre-heat valve also serves as positive oxygen shut off. Included in the outfit are regulators with a 5.9-sq-in. diaphragm, extra welding tips, 25 ft of 3/16-in. hose, lighter and goggles. **The Harris Calorific Co.**

Circle No. 13 on Info-Aid Card.

High-speed tools designed for welding plastics

KS series is complete tool line for high-speed and medium-speed welding and sealing of thermoplastics such as polyethylene, polypropylene, rigid PVC, plasticized tank linings and other thermoplastics. All tools are interchangeable in most plastic welders. Tools are stainless steel designed for round welding rods as well as flat and corner strips for tank linings. **Kamweld Products Co.**

Circle No. 14 on Info-Aid Card.

Unit converts a-c to d-c in 60 seconds

Silicon-rectifier converter converts a-c to d-c in 60 seconds. One model is rated at either 300-amp 40% duty cycle or 250-amp 60% duty cycle. Other model is rated either 500-amp at 45% duty cycle or 450-amp at 60% duty cycle. Portable self-contained unit can be placed on a-c welder of any amp for temporary, intermittent or permanent operation. Lower rated model weighs 100 lb. Higher rated model weighs 110 lb. **A. O. Smith Corp.**

Circle No. 15 on Info-Aid Card.

Two-stage regulators have single balanced valve

Regulators in 400 series are two-stage with single balanced valve to prevent outlet pressures being affected by variations in inlet pressures. Valve will not flutter or vibrate even when full cylinder pressure is suddenly applied with pressure adjustment to maximum. **Kim Products, Inc.**

Circle No. 16 on Info-Aid Card.

Oxygen, acetylene fittings are reusable

Standard and specialized couplings, assemblies, adapters, connectors, stems and joiners designed for oxygen and acetylene applications are all reusable. One and two rayon braid hose fittings are in range of sizes to fit standard connections. Variety of reusable fittings are also available for paint-spray connections. **The Lenz Co.**

Circle No. 17 on Info-Aid Card.

Free machining plate steel is stronger

Fremax 45 is a new stronger free machining plate steel. It has a relatively high tensile strength and yield point with a carbon content of 0.40/0.50. It was developed for special high strength wear resistant applications and provides easy flame hardening. **United States Steel Corp.**

Circle No. 18 on Info-Aid Card.

BETTER WELDING THROUGH ARCOS RESEARCH

Arcos technicians check temperature of weld specimens in stress rupture laboratory.

Arcos research and development keep Arcos ahead in today's fast-changing technology. Demands for higher strengths, lighter weights, superior properties, along with lower costs require constant study of materials and techniques. Full time Arcos research is aimed at developing better filler metals and improved methods of applying them. Search . . . formulate . . . test . . . this continual activity means high quality dependable performance when you weld with Arcos.

ARCOS

Arcos Corporation · 1500 S. 50th St. · Philadelphia 43, Pa.

Now You Can Weld or Cut with a HELIARC "Tig-Twin" Kit...

When you own one of the new LINDE Heliarc "Tig-Twin" Kits, you're ready to take on almost any inert-gas-shielded arc welding or cutting job!

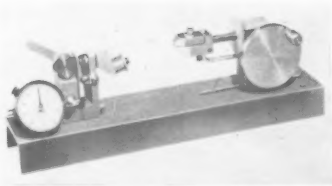
Use the lightweight torch for Heliarc welding. It's the fast, convenient method of joining ferrous and non-ferrous metals without flux. Then use the same torch to cut light-gage metals—without additional attachments.

Heliarc "Tig-Twin" Kits contain standard, high-quality LINDE components. They're designed to perform economically through years of trouble-free service. And the price is right. Talk to your nearby LINDE distributor now. Or write for his address to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y. In Canada: Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

LINDE COMPANY

UNION CARBIDE

LINDE, HELIARC and UNION CARBIDE are registered trade-marks of Union Carbide Corporation.



Portable tensile tester weighs only 6½ lb

Model VTA portable tensile tester weighs 6½ lb. Available in 50 and 100-lb load capacities, tester is designed for field and sales work. Unit provides data for small gage wire, spot weld coupons, rope, string, textile materials. Indicator needle locks at maximum load and has push-button release. Minimum test specimen length is ½ in.; maximum is 8 in. **Detroit Testing Machine Co.**

Circle No. 19 on Info-Aid Card.

Parallel straight edge has built-in level

Aluminum or semi-steel parallel straight edge has built-in level. Unit checks levelness and accuracy of machine bed at same time. Six foot aluminum unit weighs 35 lb. All working surfaces are precision ground flat and parallel to 0.0005 in. overall. **The Challenge Machinery Co.**

Circle No. 20 on Info-Aid Card.

Single-stage regulator has no gage

Model 29 gageless single-stage regulator has capacity sufficient to cut 12-in. steel plate. Cylinder connection nut is supported over seat of inlet stem protecting seating surface from damage. Seat closes with pressure. **Harris Calorific Co.**

Circle No. 21 on Info-Aid Card.

Container keeps electrodes at specified moisture

Hotbox maintains welding electrodes at factory specified moisture content and provides positive protection of electrodes from moisture "pick up". Moisture control reduces surface and underbead cracking, hidden porosity, surface splatter and hydrogen embrittlement. **W Corp.**

Circle No. 22 on Info-Aid Card.

Servospeed
HEART OF AUTOMATION
MODERN ELECTRONIC ENGINEERING GIVES PRECISE MOTOR SPEED CONTROL
1/100 — 10 H. P.
Modern industrial electronic engineering has been coordinated with electric motor design to provide a versatile means for obtaining the full possible advantage of speed control in DC motors while operated from the regular alternating current power line. Grid controlled "Thyratron" tubes are utilized for power controlled stepless variation to supply motor armature power. Patented feedback, or "Servo" circuits provide constant torque capability over wide speed ranges of as high as 60 to 1 in some models and a minimum of 20 to 1 in others.
Servospeed
DIV. of ELECTRO DEVICES, Inc.
4 Godwin Ave., Paterson, N. J
ARmory 4-8989
Circle No. 165 on Welding Info-Aid Card

Electric cable tubing eliminates wear, burns

Zippertubing eliminates wear and spark burns on electric cables. Tubing is shipped as flat tape for easy storage. Tubing is wrapped around cable and zipped closed or can be permanently sealed. **The Zippertubing Co.**

Circle No. 23 on Info-Aid Card.

Electronic timer can be used for Tig welding

Electronic timer, completely automatic and featuring instant reset, can be used for Tig welding. Device can be used for single operation or as part of a cascade system. Unit has time range of ½ second to 90 seconds with a variable or fixed interval in this range. Power source is 115 volts, 50-60 cycle a-c. **The Pioneer Electric & Research Corp.**

Circle No. 24 on Info-Aid Card.

A-c welder designed for mild, stainless steels

TC a-c welder is designed for high-production welding of mild and stainless steels. Welder operates from 230/460 volt, 60 cycle; nominant rating is 500 amp at 40 load volts, 60% duty cycle, 74 volts open circuit. Two or more units may be paralleled to obtain a current range equal to the sum of the settings for each unit. **Westinghouse Electric Corp.**

Circle No. 25 on Info-Aid Card.

—your LINDE distributor!

These days, more and more developments in welding hold the solution to knotty metalworking problems. The efficiency, economy, and versatility of modern welding methods and equipment are benefits which you should know about when joining or cutting metals.

Your nearby LINDE distributor is the best man to give you help. He is an independent local business man, easy to reach and talk to, fully stocked with a complete line, familiar with local industry. And he's backed by LINDE's technological leadership of more than 50 years' standing. Just as he can give fast delivery of all the superior equipment and materials you need—he can get you the specialized, and profitable, answers to your questions as they come up in the field.

Prove it to yourself—call your nearby LINDE distributor. He's in the classified directory. He is as close as your telephone. Or, write for his address to Linde Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N.Y. *In Canada:* Union Carbide Canada Limited, Linde Gases Division, Toronto 12.

Your LINDE Distributor

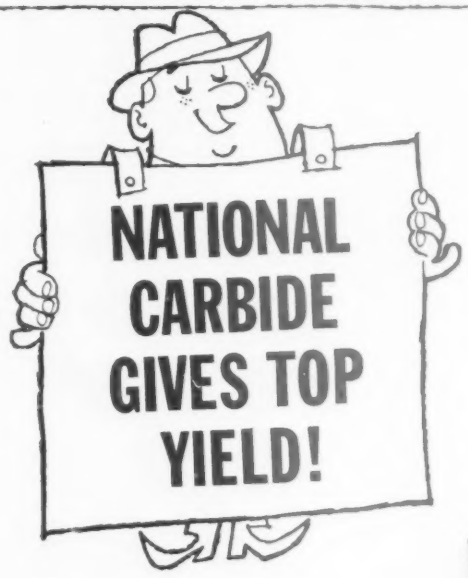
"Where One Call Gets It All"

LINDE COMPANY

UNION CARBIDE

"Linde" and "Union Carbide" are registered trade marks of Union Carbide Corporation.

For more facts Circle No. 166 on Welding Info-Aid Card



All you want—when you want it in the **RED DRUM.**
All sizes, in quantities from 2 lb. pkgs. to 5 ton hoppers.

Calcium carbide is a product of:

AIR REDUCTION CHEMICAL & CARBIDE CO.
A Division of Air Reduction Company, Incorporated
150 East 42nd St., New York 17, New York, MUrray Hill 2-6700 area code 212

NEW NEW NEW NEW NEW NEW NEW NEW NEW

when it
MELTS
you know the *temperature!*

NEW *Markal*
THERMOMELT
TEMPERATURE
INDICATORS

With Handy Adjustable Holder

The easy modern way to determine exact working temperatures!

Just mark or stroke the surface with THERMOMELT . . . when it reaches the desired temperature, the mark liquefies. There's no guesswork, no wasted time or material . . . THERMOMELT is the quick, precise way to determine heating temperatures. Accurate to within ±1%.

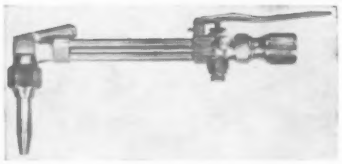
A Stik For Every Temperature from 113° F. to 2000° F.

SEND TODAY for free THERMOMELT literature and pellet sample (indicate temperature desired).

ALSO AVAILABLE IN LIQUIDS AND PELLETS for inaccessible or hard-to-measure applications. Wide range of temperatures.

Made by the Manufacturers of Markal Paintstik Markers and Protective Coatings.

MARKAL CO. 3108 West Carroll Avenue • Chicago 12, Illinois



Medium pressure cutter will not backfire

Model 73 medium-pressure cutting attachment will cut up to 6 in. Device can be used with firm's No. 63, 43 and 18-2 torches. Attachment with head-mix is almost impossible to backfire. Double silicone O-ring seals are used and auxiliary or preheat oxygen valve serves as positive shut off. **The Harris Calorific Co.**

Circle No. 26 on Info-Aid Card.

Metal-removal torch designed for pad washing

Model "V" metal-removal torch cuts, gouges and bevels all types of metals. Designed primarily for pad washing in steel and alloy foundries, it is also useful in exterior fin and other sprue removal and on any heavy-duty metal removal. A 3/4-in. concentric cable assembly is furnished with torch which is available for ½, 5/8 or 3/4-in. electrodes. Current requirements vary from 400 to 1,600 amp and air pressure required is 80 psi. **Arcair Co.**

Circle No. 27 on Info-Aid Card.

Molybdenum wire designed for spray metallizing

Molybdenum wire and line of metal powders, oxides and carbides are designed for spray metallizing and plasma arc applications. Unalloyed molybdenum wire comes in diameters from 0.125-in. to 0.057-in. (-0.002). Tensile strength is set at 85,000 to 110,000 psi. **Wah Chang Corp.**

Circle No. 28 on Info-Aid Card.

Welding glove is fully lined deerskin

Pearl flesh split Brazilian deerskin welding glove is lined for added insulation and perspiration absorption. Cuff is fully lined with lightweight suede to prevent chafing. Glove has 6½-in. cuff for extra arm protection. **Riegel Textile Corp.**

Circle No. 29 on Info-Aid Card.

For more facts Circle No. 167 on Welding Info-Aid Card

Portable radioisotope unit is self-contained

Pipeliner is a completely self-contained portable radioisotope unit for industrial inspection from atomic submarines to welded pipelines. The one-man unit offers 10, 20 or 30-curie power and can radiograph 2-in.-thick steel. Unit uses Iridium 192 housed in a special lead-tungsten alloy as radiation source. Total unit weighs 60 lb. **Picker X-Ray Corp.**

Circle No. 30 on Info-Aid Card.

Visitor spec dispenser holds 12 pair of glasses

Free dispenser in green, white and black holds 12 pairs of VS3 visitor specs. Equipped to hang on gate house or set on desk or table, dispenser has tear-out section at bottom for dispensing individually polyethylene-bagged specs one at a time. Pull-out strip indicates number of specs remaining in dispenser. Simple to reinsert specs where visitors' specs reissued. Specs fit over any size prescription glasses. **Willson Products Div.**

Circle No. 31 on Info-Aid Card.

Spike bench unit welds small electronic parts

Line of standard spike power bench welders is designed and built specifically for welding transistors and minute electronic components. "S" series welders deliver from 2-lb to 500-lb weld pressure on varying models. Advantages of the process are low heat effect in weld zone, reduced shunt effect, columnar current pattern and low weld pressure requirements. **National Electric Welding Machines Co.**

Circle No. 32 on Info-Aid Card.

Grinding wheel handles welds, light snagging

Cut-N-Saucer grinding wheel has saucer-shaped wheel and convenience of throw-away mount. New wheels are available in 7-in. and 9-in. sizes to fit standard threaded spindles on portable grinding equipment. Wheel also handles light snagging. No separate mounting pad is required. **Norton Co.**

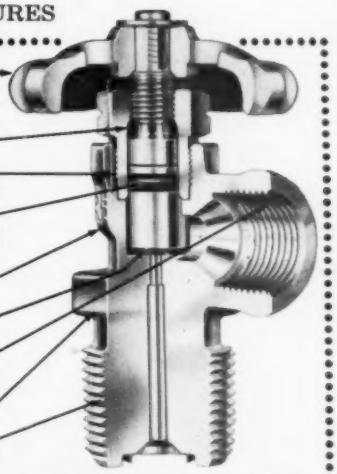
Circle No. 33 on Info-Aid Card.

new!
RegO series 600
acetylene cylinder valve

OFFERS ALL 3!

- EASY, CONVENIENT HANDWHEEL "O"-RING OPERATION . . . no wrenches to bother with, lose or misplace, no packing to adjust . . . opens, closes positively with a twist of the hand
- SUPERIOR, MONEY-SAVING DESIGN . . . "O"-ring wipes on replaceable bonnet, *not* on valve body . . . should wiping surface get damaged, entire body, or valve, need *not* be replaced
- FIELD-PROVEN, TIME-TESTED "REGO" DEPENDABILITY . . . exact overall design fully tested and proven in years of use in the LP-Gas industry . . . now with acetylene-acetone-compatible "O"-ring for use in welding field

PLUS THESE
MORE-FOR-THE-MONEY FEATURES



UMBRELLA-TYPE HANDWHEEL
Can't collect water; permits visual stem inspection. (Note: also available with flat disc-type handwheel).

BACK SEAT
Extra safety feature; secondary stem seal.

BONNET-BODY MAKEUP
Left-hand thread. Trim assembly can't back out.

"O"-RING
Leakproof stem seal compatible with acetylene and acetone for smooth, long maintenance-free operation.

FORGED BRASS BODY
Extra strength, longer life.

NYLON SEAT DISC
For positive shut-off with minimum effort.

OUTLET CONNECTIONS
Accurately machined to conform to CGA specifications. (511 POL or 301 Commercial available)

1⅛" WRENCH FLATS
Provide ease of installation.

INLET THREADS
NGT (extra long) available in ½", ¾" and 1"

when ordering acetylene cylinders, specify:
RegO 600 Series
Acetylene Cylinder Valve

REGO®

for free catalog No. G300-GA write: The Bastian-Blessing Company, RegO Division, 4201 W. Peterson Avenue, Chicago 46, Illinois, Dept. 28-H

No other tool saves so much time, material . . .

Arcair process cuts rework time 93%

10,000 J-47 jet engine nozzle cones of tough, heat-resistant stainless steel were disassembled for reworking by the Arcair process that cut time 93% over previous grinding methods. In addition, Arcair saved 89% on material costs.

This vital job was performed by the Carson Machine & Supply Company of Oklahoma City. The job was completed way ahead of schedule and because Arcair is a mechanical operation that does not depend on oxidation, it was not only effective in removing the stainless steel welds, but did not cause the slightest damage to these vital engine components.

You can save time and materials, too with Arcair. Call your local Arcair dealer or write for further information. Arcair Company, Lancaster, Ohio.

Arcair®

Circle No. 169 on Welding Info-Aid Card

Oxygen pigtails are copper or stainless steel

Pigtail assemblies, parts for manifold assemblies, copper and stainless steel tubing for manifold assemblies, regulator adaptors and porous metal filters for regulator inlet nipples have been added to line of brass fittings. The oxygen pigtails are for plant or filling station use and are available in copper or stainless steel. The porous metal filter is for use with "S" series regulator inlet nipples. **Western Enterprises, Inc.**

Circle No. 34 on Info-Aid Card.

Deoxidized copper used for Mig welding

Deoxidized copper wire is designed for Mig welding. Spooled copper can be used for joining copper to mild steel or to copper and bronze alloys, for copper bus bars, including heavy sections. Copper is free-flowing. Copper is being used as overlay on rocket projectiles, artillery shells, etc. Available in 25-lb, 2½-lb and 1½-lb spools in 0.035-in., 0.045-in., 1/16-in. and 3/32-in. sizes. **All-State Welding Alloys Co., Inc.**

Circle No. 35 on Info-Aid Card.

Resistance welding control has six variables in dial

Resistance welding control integrates as many as six variables of spot and projection welding into a single dial that automatically determines proper settings for over 100 material thicknesses and compositions. Calimatic dial controls are adaptable to new and used air-operated machines. Indexed to one of 30 settings, controls establish weld time, heat time, tap selection, welding pressure and other variables. **Thomson Electric Welder Co.**

Circle No. 36 on Info-Aid Card.

Polisher-grinder designed for laboratory metallurgy

Uni-Pol polisher grinder is available to metallurgical and quality control laboratories for fine metallographic specimen preparation. Unit incorporates 80 to 1,200 rpm variable speed control with semiconductor ½-hp d-c motor. Pan, lap, polishing wheel and cover can be changed as one unit in seconds. Fifty prototype units have been in service over two years without needing factory repair. **Geoscience Instruments Corp.**

Circle No. 37 on Info-Aid Card.

Circle No. 170 on Welding Info-Aid Card

No Other Product Can Do a Galvanizing Job Like *Galvalloy* Does – *HERE'S PROOF*

Heat welded seam on galvanized sheet to 600° with Torch

Rub GALVALLOY against heated surface as shown — now spread with wire brush for a bright finish.

GALVALLOY Covers the Same Amount of Area with 1/5 the Amount of Material.

Send today for Testing Sample and you'll learn Why GALVALLOY has no equal for ANY Galvanizing Job.

METALLOY PRODUCTS CO.
1233 S. BOYLE AVE., LOS ANGELES 23

GREATEST ADVANCE EVER IN WELDING GLOVES

America's best all-around fabric glove for welding

— new chemically treated fabric gives 4 times life of any regular fabric gauntlet glove.

"Bestos Gloves" are made of 18 oz. 100% cotton fabric.

"Bestos Gloves" are fire resistant in all positions! Bestos Gloves really withstand wear!

Special introductory price $7.65 per dozen.

Ideal for WELDING, HEAT TREATING and other hot metal work where flash, flame and sparks are present.

BESTOS GLOVE CO.
4226 W. Highland Ave.
Milwaukee 8, Wis.

Circle No. 171 on Welding Info-Aid Card

Protective cap has pull-down ear band

Semi Season Cap is a lightweight, cotton head covering which gives both warmth and protection. Lined cap has outside pull-down ear band and flexible visor. Washable cap comes in all sizes and a variety of colors including blue, red or green polka dots, solid black, red, maroon, dark green, white or express stripe. **Kromer Cap. Co.**

Circle No. 38 on Info-Aid Card.

225-amp welder available for light industry

A 200-amp welding current — from a minimum of 25 to a high of 225 amp — is available in a-c welder for light industry applications. Compared to its 180-amp predecessor, the new unit accommodates wider electrode range including all low hydrogen iron powder types. As an optional feature, the welder can double as a battery charger for 6- and 12-volt batteries. **A. O. Smith Corp.**

Circle No. 39 on Info-Aid Card.

Glass filter protects against radiation

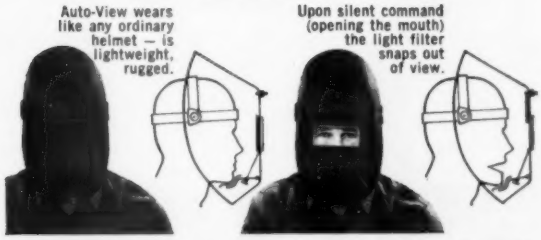
Gold-coated Weld-Cool protective glass filter is particularly adapted to gas shielded arc welding where excessive infrared radiation is present. It provides new visible light transmission in blue region of spectrum and absorbs the yellow flare associated with various processes. Plate comes in shades 10 and 12 in standard 2-in. by 4½-in. size. **American Optical Co.**

Circle No. 40 on Info-Aid Card.

For more facts Circle No. 172 on Welding Info-Aid Card

Auto-View welding helmet

Permits "NO-HANDS" Operation


Auto-View wears like any ordinary helmet — is lightweight, rugged.
Upon silent command (opening the mouth) the light filter snaps out of view.

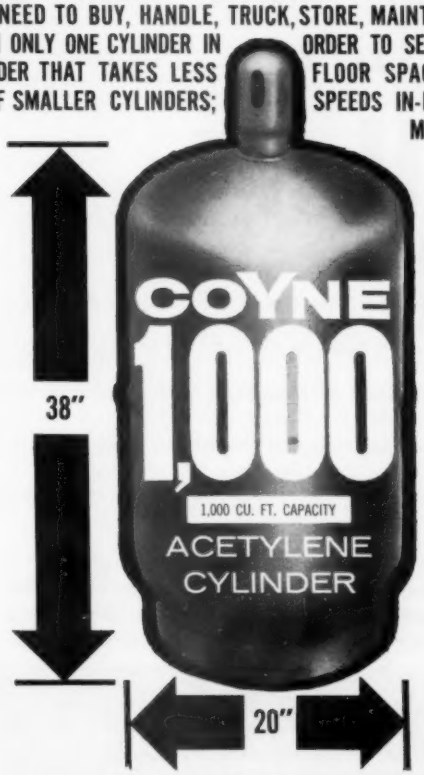
AUTO-VIEW is the new welding helmet that allows the welder to look at his work without touching his helmet — automatically, efficiently. You look through either a clear, protective window, or a leak-proof welding filter at will. The window changes at your own silent command.

The operating principle of Auto-View is simple. To remove the light filter, you open your mouth. Under your chin a comfortable pad actuates a mechanism to remove or replace the filter. For a quick look, just open and close your mouth. For prolonged looking, a HOLD button locks the filter out of the way until you start to weld again.

Auto-View is particularly useful in tight places, where it would be difficult to tilt an old-fashioned helmet. In any situation, the Auto-View saves time, makes the welding job easier, and provides greatly increased quality of work. Write for literature.

AUTO-VIEW WELDING HELMET CO. 1501 Colorado Ave. Santa Monica, Calif.

MORE PROFIT PER CU. FT. CUTS OVERHEAD 6 WAYS. NOW YOU NEED TO BUY, HANDLE, TRUCK, STORE, MAINTAIN AND DO "PAPER WORK" ON ONLY ONE CYLINDER IN ORDER TO SELL 1,000 CU. FT. OF GAS. ONE CYLINDER THAT TAKES LESS FLOOR SPACE THAN ANY COMBINATION OF SMALLER CYLINDERS; SPEEDS IN-PLANT HANDLING; DELIVERS MORE GAS ON EVERY TRUCK



ANOTHER FIRST BY

COYNE cylinder company

Division of AMERICAN CYROGENICS, INC.

224 Ryan Way
So. San Francisco, Calif.

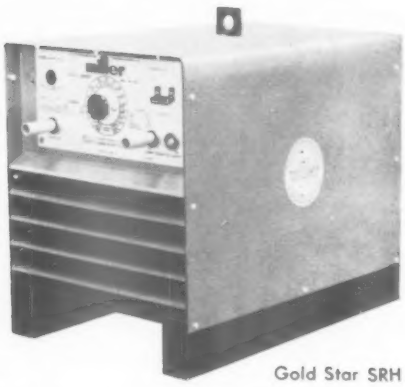
155 W. Bodley Ave.
Memphis, Tenn.

3800 Springdale Ave.
Glenview, Ill.

For more facts Circle No. 173 on Welding Info-Aid Card

YOU GET MORE with a miller

Gold Star SR



Gold Star SRH

. . . . Much more! More and better welds in less time, for one thing. You buy the welder just once . . . but every minute it's in use, it's bearing big interest in the form of increased production. More welder life too: Better basic design combines with Miller's own selenium rectifier to deliver performance, reliability and rectifier durability never approached elsewhere. And more economy too? Yes, especially more economy. That's why motor generator sets – even new ones – are being replaced daily with Miller Gold Star SR welders.

Write for descriptive literature on the Miller Gold Star SR or SRH, or see your local Miller dealer for a demonstration on the how and the why of the "More You Get With a Miller." He proves it! Also available upon request is a new and interesting pamphlet "Rectifiers for Welding" — which you should have.

miller ELECTRIC MANUFACTURING COMPANY • APPLETON, WISCONSIN
EXPORT OFFICE: 3 West 57th Street, New York 19, N. Y. Distributed in Canada by Canadian Liquid Air Co., Ltd., Montreal

AUGUST, 1961
Our 45th Anniversary Year

ESTABLISHED 1916

Notable converts

RECENTLY, WELDING has gained some notable converts, the steel fabricators. And like most converts, they are very enthusiastic.

Unfortunately, their conversion was prompted more by competitive circumstances than by welding's inherent merits. But at least they will reap the benefits, as will welding and the general public.

Many steel fabricators were reluctant to use welding in building and bridge construction because they made, sold and used competitive joining equipment — rivets, high-tensile bolts and allied machinery.

As a result, buildings erected with these antiquated joining methods required 16 to 33% more steel than comparable welded buildings. Even when steel supplies were low and welding could have stretched available quantities, the steel companies, along with many architects and engineers, were adverse to welded design.

But the picture has changed. The cost of steel bridges has become extremely high, so many state highway departments have turned to pre-stressed concrete for bridges up to 100 ft long. Of course, steel wire and reinforcing rod is used — but much of this material is foreign made.

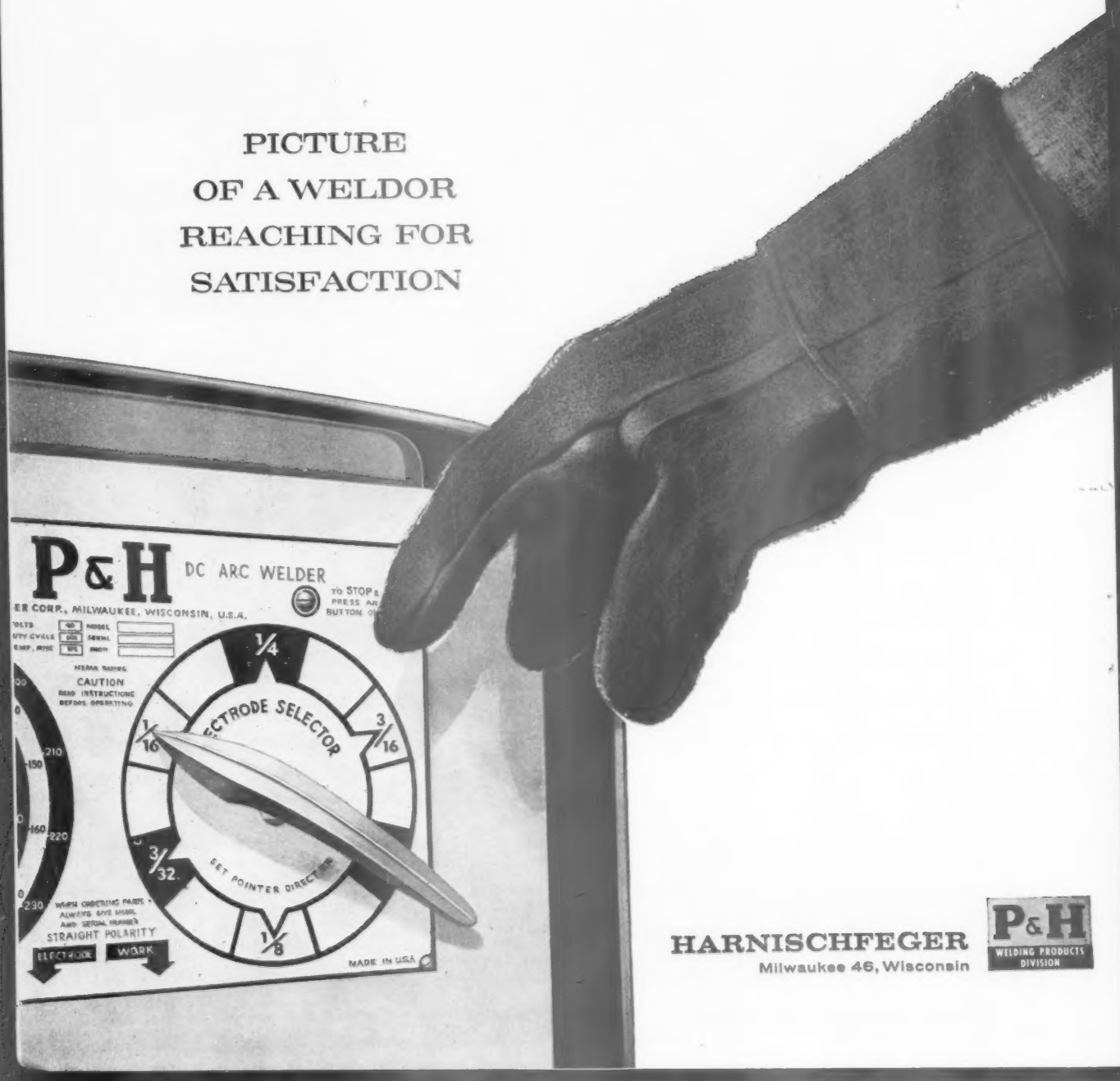
The steel companies were on the verge of losing both the heavy structural bridge and the reinforcing steel markets. Fortunately, by utilizing high-strength, low-alloy steel and welding, they can again be competitive.

A great opportunity lies ahead because of the rapid pace being set on the federal highway program. Welding will not only bring business to American steel companies, but will allow the American taxpayer to get more highway for his dollar.

In a surge to a 17 month high, fabricated structural steel bookings for May were 30% ahead of May last year. Since the major portion goes into bridges and buildings, welding's golden era in this field may not be too far away.

We all have a selling job to do. Let's make sure that American steel is fabricated by welding.

PICTURE
OF A WELDOR
REACHING FOR
SATISFACTION



HARNISCHFEGER
Milwaukee 46, Wisconsin

P&H
WELDING PRODUCTS
DIVISION

FLANGES for stainless steel piping are Mig welded by units produced by Air Reduction Sales Co.

The shielding gases . . . their function in the welding arc

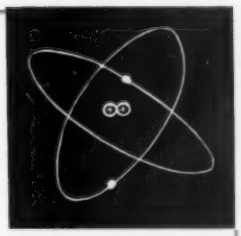
MODERN METALS are meeting the stringent requirements of the space age with their high corrosion resistance, excellent strength-to-weight ratios and good physical properties.

Add the advantages of welded fabrication, and the metals become a modern engineer's dream-come-true.

At welding's elevated temperatures, however, many of these metals absorb oxygen, nitrogen and hydrogen, causing porosity and embrittlement. So the prime consideration when welding them is weld zone protection from atmospheric elements.

One solution: a shielding gas.

Since the basic function of any shielding gas is to displace air, the gas can be inert (argon, heli-



What makes a gas inert?

The inert gases are inactive chemically because they are composed of atoms whose outermost shells of electrons are complete. A helium atom has one shell, which contains two electrons. The atom of each of the five other inert gases (argon, neon, krypton, xenon, radon) has eight electrons in its outer shell.

Since the maximum number of electrons in the outer shell of an atom is two if the atom has only one shell of electrons, and eight if it has more than one shell, the atoms of the inert gases are stable and do not tend to either give up or take on electrons.

um) or heavier-than-air (carbon dioxide).

Although four other inert gases are listed on the periodic tables (neon, krypton, xenon, radon), only argon and helium are commercially available for welding. And even the supply of helium is restricted, since the sole producer is the federal government (*see box at right*). Carbon dioxide supplies are plentiful.

These three gases, coupled with Tig and Mig welding, are producing the porosity-free welds demanded by the missiles, rockets, jets, nuclear reactors, etc., which use space-age metals.

Discovery of these gases dates back to the 17th and 18th centuries.

In 1785 the English physicist and chemist Henry Cavendish removed oxygen and nitrogen from a sampling of air and noted that a small amount of gas (chiefly argon) remained.

Sir William Ramsey, in 1898, evaporated oxygen and nitrogen from liquid air, and by fractional distillation, separated the liquid residue into five of the inert gases mentioned above. (Radon, a product of radium decomposition, was discovered in 1900.)

Carbon dioxide was discovered in 1600 by Flemish scientist Jan Baptista van Helmont who recognized it as a by-product of burning charcoal, fermentation and the reaction of vinegar and limestone.

Until 1788, however, the composition of carbon dioxide was unknown. In that year, French scientist Antoine Lavoisier identified it as a combination of carbon and oxygen, called it carbonic acid gas.

Although the inert gas separation methods used by Ramsey over sixty years ago may seem crude compared to today's efficient, high-production methods, the principle is the same:

Tapping off the major elements of air for argon, or natural gas for helium, at their respective boiling points; —302.2 F for argon and —450.2 F for helium.

Argon forms about 8/10 of 1% of the earth's atmosphere and thus, is fairly abundant and readily separated from air. In fact, argon can be called a by-product of oxygen liquefaction. (See *Oxygen, its production, distribution and uses,* WE, Feb., 1961, page 25.)

Cooled air is first scrubbed free of carbon dioxide, moisture and other impurities. (This scrubbing is also the first step in CO_2 production; see below.)

The cleaned air enters a rectification column where the main constituents are boiled off. Liquid argon and nitrogen are then tapped off and diverted to storage areas. To liquefy oxygen, the temperature is lowered still more.

The same liquefaction and distillation process is used to produce helium. But since helium occurs in the earth's atmosphere at normal concentrations of only 5.24 parts per million, the primary source is natural gas wells.

On an average, about 1% of natural gas is helium, but in 1929 a flow of gas assaying at 8% was struck at Thatcher, Colo. This and other extensive deposits in Texas, Kansas and Oklahoma make possible quantity production of helium, although regulated by the government.

The natural gas is collected, compressed and cooled. As cooling progresses, first the hydrocarbons liquefy, then nitrogen and finally helium (at better than 98% purity). Then chemical absorbents bring final helium purity to better than 99.9%.

Most carbon dioxide is extracted from flue gases produced by burning natural gas, fuel oil or coke, or as a by-product of lime kiln calcining operations, ammonia manufacturing or alcohol fermentation. (The latter two yield gases containing almost 100% CO_2 concentrations.)

The raw gas is thoroughly scrubbed with water and a caustic solution. The clean gas is then passed through an alkaline solution of sodium carbonate, potassium carbonate or monoethanolamine, any of which absorbs most of the carbon dioxide. The absorbing agent is then heated to free the pure CO_2.

After further purification and dehydration, the gas is compressed, condensed to a liquid. When concentrations are high enough, absorption and boiling off steps are eliminated.

As mentioned above, these shielding gases are used in Tig and Mig welding, either singly or in proportionate mixtures. Each gas or mixture, naturally, has unique properties which affect porosity, welding speed, deposition rate and cost.

Argon provides a smoother, quieter arc action, a lower arc

The government . . .

. . . almost left the helium business in 1954 when the Interior Department's Bureau of Mines proposed selling its four helium plants to private industry. Unfortunately, when it made the announcement, the department bypassed Congress, whose resulting wrath caused the plan to be shelved.

One government helium plant is located at Soncy, Texas, where the gas is refined and from whence it is shipped to military bases and commercial distributors. One such distributor, Linde Co., recently announced it will build a liquid helium plant at nearby Amarillo. Scheduled for completion in January, 1962, the plant will have a production capacity of 100 liters per hour, making it the largest such commercial unit in the country, according to the New York firm.

voltage at any given current value, and a greater cleaning action. One explanation of the cleaning action is that during d-c reverse polarity welding or the reverse polarity cycle of a-c welding, electron flow from the plate breaks up oxide layers and disperses them.

(The gas is raised to such high temperatures that its molecules break up and strip off some of the electrons from the atom, thus partially ionizing the gas.)

When Tig welding dissimilar metals, argon is better than helium, since it minimizes the effects of changes in arc length. In addition, when low current or a-c is used, arc starting is easier with argon.

On the other hand, helium produces greater (40%) arc voltage per unit of arc length, results in a hotter arc, deeper penetration, greater welding speeds, and reduces heat effects on the work. Helium is therefore preferred on automatic, high-production welding.

When helium is used with Mig and reverse polarity, there is no cleaning action. Metal transfers from the electrode in larger drops and tends to spatter. The beads are broader, flatter and penetration is more uniform, lacking argon's deep central penetration.

For a given current and arc length, arc voltage is higher, wire burnoff is greater.

Used on Tig welding, however, helium permits more extensive control of automatic welding when automatic head motion is regulated by arc voltage. With d-c straight polarity, helium is more stable, has a hotter arc permitting faster welding.

With a-c, helium gives inconsistent starting of the Tig arc. When mixed properly with argon, helium produces increased speeds and current density, and greater penetration with balanced a-c or a-c with continuous high frequency.

When helium is too hot or argon too cool, they may be mixed to obtain any combination of their characteristics. As argon is added above 20%, the arc becomes more stable. Adding 75% helium to the mix practically eliminates any spatter tendency in Mig welding. Bead contour shows penetration pattern characteristics of both gases.

Carbon dioxide in recent years has gained popularity as weld shielding because of its low cost. Quality welding of low-carbon and medium carbon steels is possible, as well as deep penetration and high metal deposition for single pass welding. Chief drawback is a tendency for the arc to be rather wild and spattery.

Spatter, however, can be kept within reasonable limits if a very short uniform arc length is maintained. (The recently developed flux-coated and flux-cored welding wires for CO_2 gas shielded metal-arc welding also minimize spatter.)

Since carbon dioxide breaks down into carbon monoxide and a relatively high percentage of oxygen, it is used mainly on mild steel. It may also be used on low-alloy steel if a 20% CO_2, 80% argon mixture is used.

Shielding gas mixtures are not confined to the inert gases themselves. Experiments have been conducted with mixtures of argon and helium with other gases to improve welding characteristics.

Best results have been obtained with oxygen. The M-1 gas is a 1% mixture with argon, while M-5 is a 5% oxygen mixture. Both are used in Mig welding only, since the oxygen would cause rapid loss of a tungsten electrode.

Research has shown that the droplet rate (metal transfer) can be materially increased with these percentages of oxygen. The increased rate, with no change in current density, permits welding at higher speeds without undercutting.

And at the increased speed, coalescence of the weld metal is improved, so lower current densities are permitted and larger diameter wires can be used for a given welding current.

(A comparison of penetration characteristics for the three main shielding gases and the two mixtures are shown in Fig. 1.)

Hydrogen used with Tig welding has resulted in increased arc potential. The effect is more pronounced with helium than with argon. However, mixed with argon, hydrogen also improves weld shielding at low gas flows.

As much as 35% hydrogen has been added to argon and a 20% addition produces an arc voltage equal to that obtained with helium alone for the same rate of gas flow. The argon-hydrogen mixture is limited to welding stainless steels.

Still another gas, nitrogen, has been suggested as a shield. (See *Nitrogen for Tig welding?*, WE,

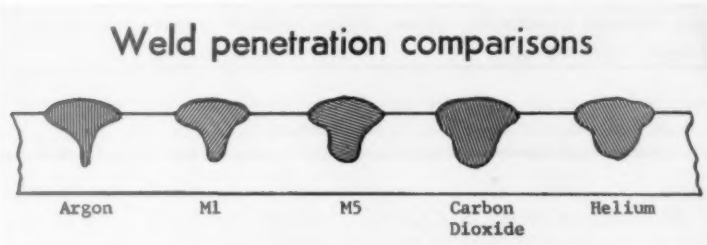


FIG. 1 — Cross-section of welds made with the three main shielding gases and two mixtures show penetration differences.

Best results with shielding gas mixtures, other than argon-helium mixtures, have been obtained with oxygen. M-1 gas is a 1% oxygen mixture with argon, while M-5 is a 5% oxygen mixture.

Both are used in Mig welding only, since oxygen would cause rapid loss of a tungsten electrode.

Shielding gas recommendations for Mig and Tig welding

Metal	MIG	TIG
Mild steel	Carbon dioxide: high quality, low-current out-of-position welding.	Argon preferred. Helium gives greater penetration, but more difficult to handle.
Low alloy steel	Argon plus 2% oxygen: eliminates undercutting tendency, removes oxidation. Also acceptable, 80% argon, 20% carbon dioxide.	Argon for manual: easier to handle. Helium for automatic: provides higher speeds.
Stainless steel	Argon plus 5% oxygen: improves arc stability when using d-c straight polarity.	Argon for thin gage: controlled penetration. Helium for heavier gage: greater penetration.
Nickel, Monel, Inconel	Argon: good wetting, decreases weld metal fluidity.	Argon for manual: easier to handle. Helium for automatic: provides greater speeds.
Aluminum alloys	Argon: with d-c reverse polarity, removes surface oxides. For Mg-Al, use 75% helium, 25% argon: high heat input reduces porosity tendency, cleans surface oxide.	Argon: preferred for a-c, has arc stability, good cleaning action. For d-c straight polarity use helium: stable arc, higher welding speeds.
Magnesium	Argon: with d-c reverse polarity removes surface oxides.	Argon: good cleaning action, use a-c, d-c rarely used.
Titanium	Argon: reduces heat-affected zone, improves metal transfer.	Argon for manual: easier to handle. Helium for automatic: provides higher speeds.
Deoxidized copper	75% helium, 25% argon preferred: good wetting, higher heat input to counter high thermal conductivity. Argon for light gages.	Helium preferred: high heat input to counter high thermal conductivity. 75% helium, 25% argon: stable arc, somewhat reduced heat input.
Aluminum bronze	Argon: reduced penetration, generally used for surfacing.	Argon: reduced penetration, generally used for surfacing.
Silicon bronze	Argon: reduces crack sensitivity on hot short material.	Argon: reduces hot short tendencies of material.

Nov., 1954, page 43.)

Nitrogen has been used to Tig weld deoxidized copper. But since this gas is readily soluble in steel at welding temperatures and gives rise to aging effects, it seems unlikely that it will ever be used to weld mild steel. Additions of 5% hydrogen to nitrogen have been used as a backup shield for stainless steel, producing brighter weld root beads.

What is the future of the major shielding gases?

According to the U. S. Chamber of Commerce's Business and Defense Services Administration and WELDING ENGINEER's Research Department, production and shipments of industrial gases in 1961 are expected to be greater than in 1960.

Last year more than 563 million cu ft of argon was produced (an increase of almost 13%). And an estimated 400 million cu ft of this total was used for shielding in Mig and Tig welding. Small amounts were also used in producing titanium and zirconium.

Based on greater availability, one producer foresees a continuation of argon's growth, with emphasis on welding, metals production and electronic applications.

Similar increases are anticipated for the other shielding gases as well.

(For a reprint of this article, circle number 249 on the Welding Info-Aid Card, page 75.)

Industrial gas data

	Acetylene	Argon	Carbon dioxide	Helium	Hydrogen	Nitrogen	Oxygen	Propane
Chemical symbol	C_2H_2	A	CO_2	He	H_2	N_2	O_2	C_3H_8
Atomic number	—	18	—	2	1	7	8	—
Atomic weight	—	39.94	—	4.003	1.0080	14.008	16.00	—
Molecular weight	26.04	39.99	44.01	4.00	2.062	28.066	32.00	44.094
Specific gravity	0.9056	1.378	1.101	0.1368	0.0695	0.9673	1.1053	1.558
Density lb/cu ft	0.069	0.1049	0.11412	0.01035	0.005205	0.07245	0.08279	0.1164
Melting point (F)	—	−308.5	−69.9	−457.6	−434.4	−345.6	−361.1	−310
Boiling point (F)	−121	−302.2	−109.3	−450.4	−422.9	−320.6	−297.4	−48.1
Critical temperature	98.6	−85.6	88.4	−450.2	−398.0	−147.2	−181.8	206.6
Critical pressure	906	706	1057	188	294	493	725	648
Latent heat of vaporization	—	72	—	10.3	194.2	86	92	184
B.T.U./cu ft	1556	—	—	—	344	—	—	2667
Cu ft/lb	14.5	9.67	8.73	96.71	192	13.8	12.08	8.55
Cu ft/gal liquid	—	113.2	—	100.6	103.7	93.2	115	42

FUEL outlet fitting is Tig welded to satellite system propellant tank hemisphere at Lockheed Missile and Space Division.

Will Mig and Tig meet your needs?

Be sure you know the answer before changing from your present welding process

by **W. G. Schumacher**
National Cylinder Gas Div.

BECAUSE OF THEIR 100% protection from atmospheric elements, welds made with one of the inert gas-shielded arc methods are stronger, more ductile and more corrosion-resistant.

In addition, the intense concentrated arc heat makes it possible to obtain high welding speeds with thorough penetration and little distortion.

These are just some of the advantages of Mig and Tig welding, and highly desirable, too.

But before you change to either one of these welding methods, you should know something about their operation and those factors which govern their proper usage.

Mig and Tig welding are basically identical, except that in the former the electrode, a bare wire, is fed automatically into the arc and is deposited as weld metal.

In Tig welding, a tungsten electrode is used because of its high melting point. Combined with an inert gas, it is virtually non-consumable. A filler metal, when used, is added by melting the end of a welding rod into the weld pool just as in oxyacetylene welding.

The inert gas, in conjunction with a proper welding current, not only protects the weld pool, but also creates a cleaning action (*see preceding article*).

The main function of the inert gas, however, is to displace air. Hence, correct gas flow for any particular operation depends on several factors: metal being welded, the inert gas, molten pool size, welding speed, and the presence (or lack of) drafts in the welding area.

(Gas flow is independent of the weld's heat requirements since it is not directly involved in the actual heating operation.)

Welds can be made in practically all metals without use of oxide-removing fluxes, and with manual equipment, welds can be made in all positions.

In the gas-shielded welding processes, the arc is produced by passage of an electric current through the ionized inert gas, whose atoms lose electrons and are left with a positive charge.

(The gas is raised to such high temperatures that its molecules break up and strip off some of the electrons from the atom, thus partially ionizing the gas.)

The positive gas ions flow from the positive to the negative pole of the arc, while the negative electrons go from the negative to the positive pole.

The power expended, expressed in electrical units, is the product of the current passing through the arc and the voltage drop across the arc. This drop consists of a fixed amount at each arc end and a variable amount proportional to the arc length.

Most Tig welded metals are joined using d-c straight polarity. With this current, the negative electrons are directed toward the positive plate at high velocities; positive gas ions, however, flow toward the negative electrode at relatively slow speeds.

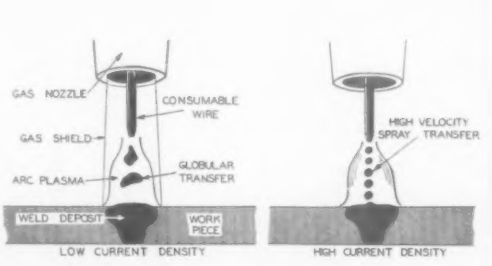
As the electrons hit the plate, heat is generated, thus heating the plate more than the electrode and producing a weld pool which is deeper and narrower than that produced by a-c or d-c reverse polarity (*see below*). As a result, contraction stresses are less and there is less trouble from hot cracking of some materials.

Straight polarity always produces a more rapid heat input (with less distortion in the base metal) and a weld pool which is molten for a shorter time, giving gas reactions less time to take place. Higher welding speeds are also possible.

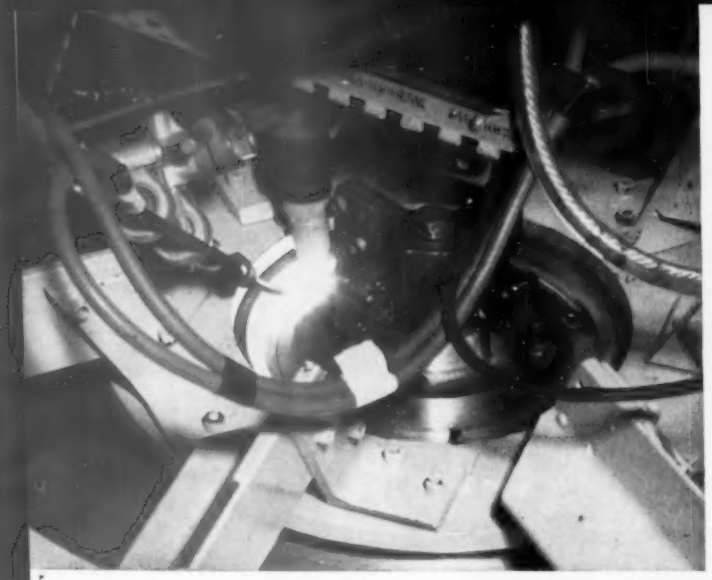
Since more heat is generated at the positive weld pool than at the negative electrode, there is less tendency to heat the electrode. Thus, a smaller diameter electrode can be used for a given current.

With reverse polarity, however, the electrode is positive, so the negative electrons strike and heat it, requiring the use of larger diameter electrodes than used with straight polarity.

Because of this low heat input and electrode overheating, reverse polarity is little used, except to Tig weld thin plates of aluminum and magnesium where its shallow, wide weld pool is more suitable.



This article is based on a talk presented at the First Biennial Short Course on Welding Engineering conducted at the University of Illinois.



(A-c, stabilized by a superimposed high frequency current, is used to weld thicker sections of aluminum and magnesium. In any case, straight polarity is not recommended for welding these two metals.)

Tig welding finds its greatest use in joining thin ferrous and non-ferrous materials, and the so-called difficult-to-weld metals such as titanium and zirconium.

It is also used in special applications, such as making root passes in pipe to be used for critical service. Here, the Tig weld leaves a clean, smooth interior surface which does not disturb the flow of fluids and does not provide crevices to harbor or trap contaminants.

Using the process with very small tungsten electrodes and low amperage to provide pinpoint welding heat, articles as small as a few thousandths of an inch thick are easily welded. (See *Weld-wax, a new method joins diodes,* WE, May, 1961, page 43.)

When used on heavy thicknesses of readily weldable materials, however, Tig welding is relatively slow and generally uneconomical. Mig welding, with its higher deposition rates, is more applicable for such large section welding.

In addition, the Mig wire-electrode does not have to be cleaned and reshaped as does the tungsten electrode whose end shape controls arc action and shape.

♦

HIGH current density gives best results in Mig welding. When current decreases (left) poor metal transfer in form of globular drops results; arc is fluttering and erratic. Increased current (right) produces steady, quiet arc with well defined cone in which metal is transferred in fine spray.

The main requirement for mechanical transfer of the metal from electrode to work when Mig welding is an extremely high current density. At a definite current density, metal transfer of a specific size and type electrode will change from globular to a spray of fine droplets.

At this current, the arc changes from a fluttering, erratic discharge to a steady, quiet column, which is well-defined, narrow and cone-shaped.

Generally, Mig welding is a d-c reverse polarity process. Coupled with its high density current, a coaxial magnetic field is created around the electrode tip.

This magnetic field and other forces cause a pinching effect which in turn causes the molten end to compress and form a tapered tip. As a result, the arc is highly stable and metal transfer is uniform and easily accomplished.

A pressure gradient exists in the central zone of the arc with higher pressures existing adjacent to the wire end. Since a pressure gradient in a gaseous atmosphere produces gas flow, a continuous gas jet and metal vapor is blown from the wire to the base of the arc's inner zone.

This explains the acceleration of metal droplets through the arc column and also the deep center core of penetration occurring just beneath the central zone of an argon shielded arc.

When welding in any position, the arc column exhibits a definite stiffness which tends to keep it in alignment with the wire's axis. Thus, the stiffness prevents the arc from taking short paths to the work when welding at acute angles.

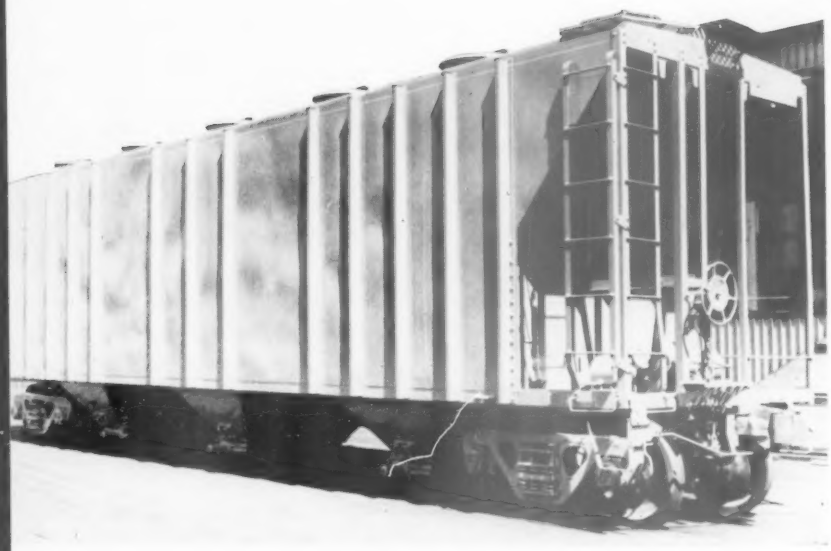
Reverse polarity provides maximum heat in the work when Mig welding. Higher quality weld deposits (from cathode cleaning action of the plate) and deep penetration result.

With straight polarity in Mig, however, the greatest heat concentration is at the electrode-wire tip. The pinch effect disappears changing the transfer of metal from spray to a large globular, erratic type and causing lack of good fusion.

Although burn-off rates of straight polarity are almost double those of reverse polarity, the accompanying instability and spatter restrict its use. (The instability, however, can be modified somewhat by an addition of 5% oxygen to the argon shield. Certain manufacturers prefer to add an emissive agent to the wire.) Alternating current is not generally used in Mig welding.

[*Ed. note: In a paper presented at this year's AWS spring meeting in New York City, C. R. Sibley, Air Reduction Sales Co., stated that a-c argon-shielded arc in Mig welding has superseded the d-c arc. Rudium and cessium compounds in the welding wire stabilize the arc and provide the proper electrical emission to prevent short-circuiting. He described how a-c produces less superheating, reduces undercutting and spatter, and is generally more applicable to joining carbon steel and thinner stainless steels.*]

(*For a reprint of this article, circle number* 250 *on the Welding Info-Aid Card, page* 75.)



ALMOST two-thirds of a mile of welded joints, over 80% made with a CO_2-shielded, flux-cored-wire welding method, went into this steel hopper car. At full production of six cars daily, more than 3½ miles of welds were made.

Miles of CO_2-shielded welds fabricate railroad hopper cars

MORE THAN 3½ miles of welds per day at speeds of up to 50 ipm were completed recently by one east coast manufacturer of railroad hopper cars.

And more than 80% of these welds were made with a carbon dioxide-shielded, flux-cored-wire welding method.

When in full production, Magor Car Co., Clifton, N. J., fabricated six of these covered, steel cars daily, each containing some 3,250 ft of welded joints — almost two-thirds of a mile.

According to the firm's welding engineer, the CO_2-flux-cored method's high deposition rate permitted speeds of up to 50 ipm with automatic equipment and over 30 ipm with semiautomatic. The welding units are manufactured by National Cylinder Gas Div., Chemetron Corp.

To meet its high production rate and to minimize problems of shrinkage and distortion, Magor fabricated as many subassemblies as possible, being limited only in size. The final assembly line consisted of some 15 different major operations.

The company's automatic and semiautomatic Mig units were easily adapted to the CO_2-shielded method by merely replacing a few parts to handle the larger diameter wire and substituting carbon dioxide for argon as the shielding gas.

Each hopper car consisted of four major subassemblies:

1 — Underframe: composed of the center sill, car bolsters, end sills and center fillers.

2 — End body bolsters: composed of body bolster webs, gussets and floor sheets.

3 — Center partitions: consisting of cross ridge and center slope sheets.

4 — Sides: consisting of side sheets, side posts or stakes, top plate and side sill.

Car body sheets were Cor-Ten low-alloy steel in several thicknesses. Hopper sheets were ¼-in. thick; sides 5/32 in.; and roof, ⅛-in. thick.

The first step in assembly was underframe construction. Two railroad half sills of mill-rolled steel (cut, punched and matched with draft lugs, ribs and key slot reinforcements welded to the inner face of each) were jig assembled and tack welded to form a boxed sill.

This sill was then automatically butt-welded along its entire length.

The welded sill was next placed in the underframe assembly jig where prefabricated bolsters, strikers and sills, and center fillers were welded to it. All welding was done on a rollover positioner to permit downhand welding. When welding was completed, the sill was placed in a body assembly jig.

Small parts lined up along the track of a traveling manipulator adjacent to the body jig were positioned and welded on a continuous 24-hour cycle. Hopper outlets and inside hopper sheets were manual metal-arc tack-welded to the underframe.

This completed assembly, the core of the car, was then placed on shop trucks and side sections and end supports welded to it.

Because of the many long linear welds involved, the flux-cored welding method was also ideal for subassembly fabrication.

Stiffeners were welded to individual body and hopper sheets on automatic jigs by boom-mounted traveling welding heads at a rate of 33 ipm.

Each car side was preassembled before being added to the car. Individual 5/32-in.-thick side sheets were butt-welded in a seaming operation to form a continuous side sheet which was then tack-welded to the side sill and top roof plate. The resulting lap joints were then welded in a single pass with the CO_2-shielded method at 40 ipm.

The vertical stakes or side stiffeners were then placed in position and moved under the side stake gantry. Indexing holes in the gantry track located the cross head over each stake as air cylinders pressed each stake to the side in its correct position. Two automatic CO_2 welders completed the joints at 50 ipm.

After assembly of the sides to the car body, the car was placed on its regular operating trucks, each consisting of two axles, four wheels, steel side frames, truck bolsters and a spring suspension system.

Next the roof car lines were tack-welded to the upper side plate and the car rolled to one of two rotary positioners.

The cars were then lifted, grasped between the head and tail stocks of the rollover positioner and rotated 90 deg in both directions for completion of all body and hopper seam welds in the downhand position.

The bulk of welding at these two positioners was done with 10 semiautomatic setups. Electric power and shielding gas were centrally supplied, while the flux-cored wire and semiautomatic control units were carried on a rail-mounted boom.

The semiautomatic seam welding was done at an average of 30 ipm; touch-up work and short welds were also made while the car was on its side using manual metal-arc welding.

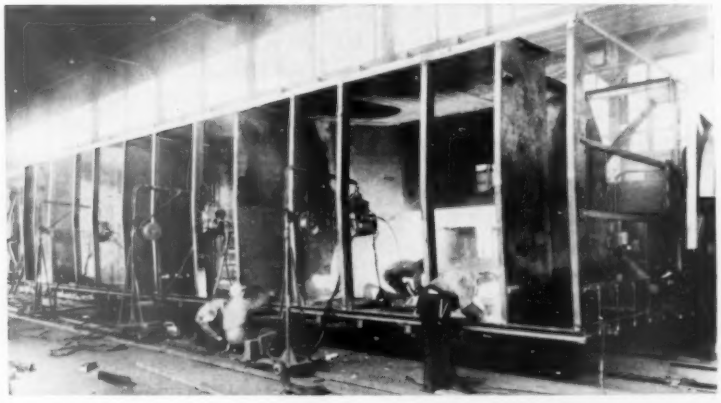
Before leaving the positioner, all assembly welds were inspected for quality and necessary repairs made. Then the car was returned to its trucks ready for final welding of the roof and hopper hatches.

The ⅛-in.-thick roof sheets were tack welded to the underside of the car line or top plate running the car's length. The car then passed to the first of two high welding gantries where two automatic welding heads ran a continuous fillet weld along the roof sheet and car line joint at up to 50 ipm.

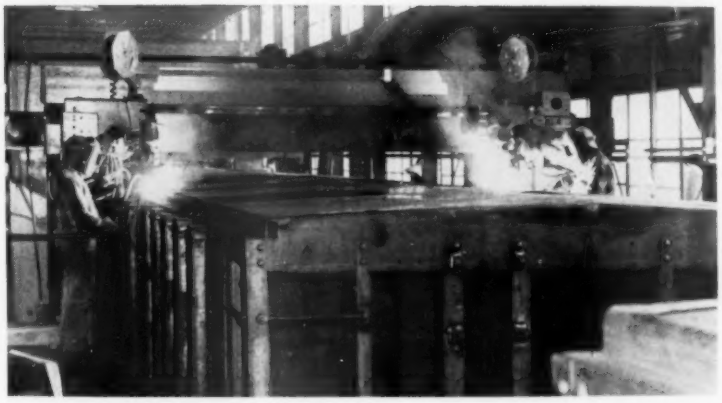
At the second high gantry, lateral roof seams were butt-welded semiautomatically from the gantry platform.

After roof completion, steel hatch frames were welded in place, again semiautomatically. The punched blanks from the roof hatch openings were installed as hatch covers and finally the preassembled catwalk was welded in position along the roof centerlines.

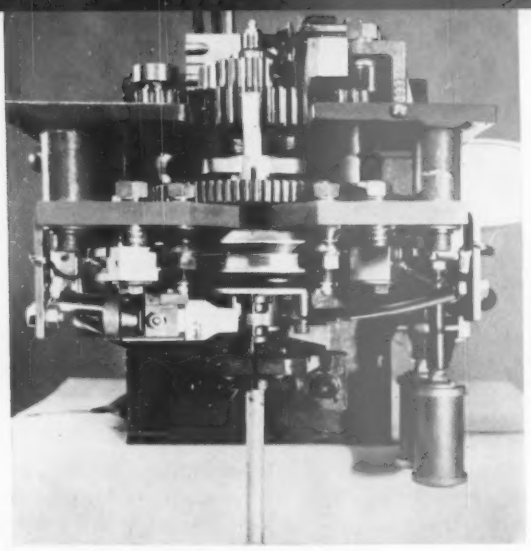
When pipe lines, valves and air brake tank and cylinders had been added, the car was ready for a water leakage test and brake checkout under normal and emergency conditions.



ROTARY positioners turn cars 90 deg in each direction for downhand welding of body and hopper seams. Rail mounted booms carry flux-cored-wire reels and control units while shielding gas and electric power come from central source.



TWO automatic carbon dioxide welders run a continuous fillet weld at 50 ipm to join the roof sheets to the car line joint. At a second gantry, lateral roof seams are butt-welded semiautomatically from the platform, still using the CO_2 method.



AUTOMATIC Tig welder handles ¼ to ½-in.-diameter tubing, which remains stationary while welding head revolves.

Revolving Tig unit cuts costs, but maintains quality

by **W. Twity** and **W. Purcell***

To TIG WELD aluminum tubing already formed into the shape of a refrigerator's evaporator compartment requires specialized and expensive fixtures.

The problem: to achieve economies without sacrificing high speeds and top-quality welds of the existing welding method.

The solution: revolve the Tig welding head instead of the part to be welded.

General Electric Co.'s Hotpoint Division in Chicago uses 32 ft of such aluminum tubing in its average size (11 cu ft) unit.

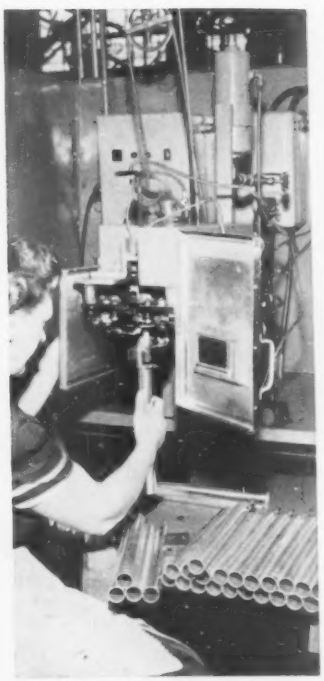
In the refrigerator, a gaseous substance is mechanically compressed, cooled and then expanded in a continuous cycle. These coils of thin-walled metal tubing carry the expanding refrigerant around the space to be cooled.

For years the standard method of welding the many ¼ to 5/16-in.-diameter joints had been to rotate the tubing in a mechanized fixture while the Tig gun remained stationary.

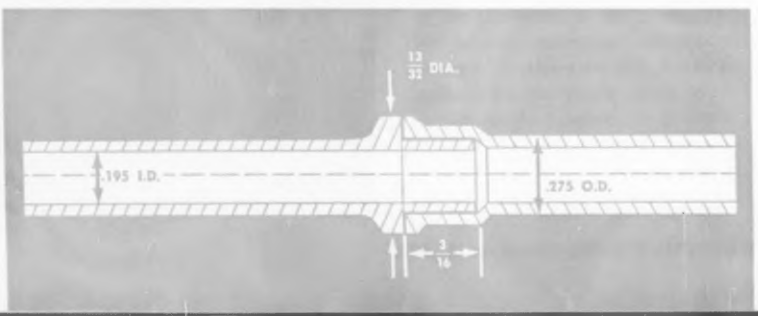
Besides being expensive, these fixtures were not able to handle such tubing readily.

However, with the rotating Tig unit, developed by Linde Co. and Hotpoint engineers, tubing in any stage of assembly, including coils and assembled components, can be easily mounted and welded in the fixture.

Messrs. Twity and Purcell are, respectively, refrigeration process engineer, Hotpoint Division, and technical sales representative, Linde Co.



ALUMINUM header shell and connector are loaded in revolving Tig welder (far left). In one of six other revolving Tig welders (left), welding head joins header to evaporator. Diagram (below) shows male and female connectors on upset joint. Extra metal provides wall strength at Tig weld.



Torch position and travel speed are critical during welding because of thin (0.040 in.) walls and small diameter of the tubing, yet are easily controlled by the fixture's precise gear alignment. In addition, positive joint alignment and rigid clamping greatly improve joint quality.

Tig welding with a ¾-turn overlay results in positive tube joints and low reject rates.

At the first stage of tube welding, copper-aluminum connectors must be attached to the header shell. Male and female upset joints are used for added reinforcement at the weld.

Shells are type 1100-0 aluminum, ½-in. OD at the face. The Tig torch makes the weld at a current of 80 amp, a-c, using an argon flow of 13 cu ft per hour.

The complete welding cycle requires nine seconds: preheat (3.5 seconds), welding (3.5 seconds) and torch return (2 seconds). Actual welding speed is 46-50 ipm.

At two other tube-welding fixtures, cooling coils and headers are attached to the evaporator. Upset joints are again used for all ¼ and 5/16-in.-diameter joints for ease of alignment and protection against burn-through.

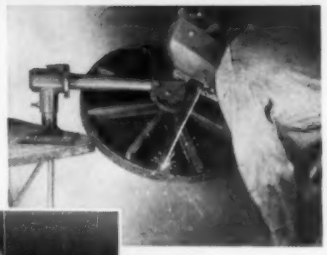
Three additional Tig tube welding machines complete the tubing assemblies.

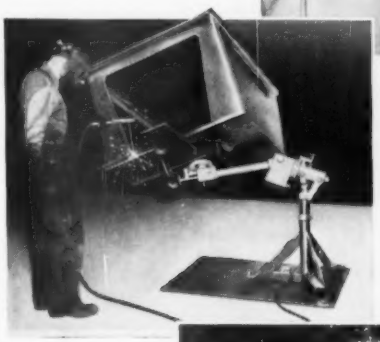
Thus, Hotpoint's requirement for high-speed, quality welds on refrigerator tubing is fully satisfied, and the revolving-torch fixtures are expected to provide reliable production and controlled quality for many years.

COOLING coil is Tig welded to evaporator at a torch travel speed of 46 *to* 50 *ipm.*

PROFITS are built on DEPENDABILITY

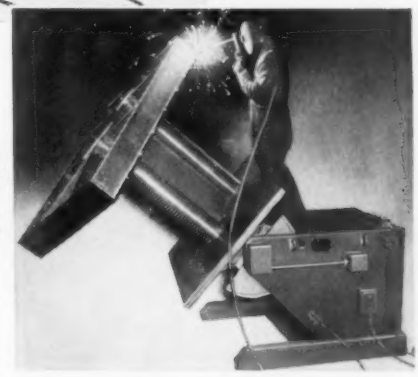
360° Table tilt allows welding on both sides of workpiece without re-clamping when you use this Aronson Bench Turntable.





Heavy bulky pieces become childs-play when balanced on an Aronson Universal Balance positioner.

Heavy Duty Gear Driven Positioner showing weldor making good use of Aronson Flat Top Design.



"Positioned" welding is much faster while the quality and appearance of the welds is superior to that of manually positioned workpieces. But to realize its profitable advantages, the positioner must give dependable service over the long haul. Aronson Positioners and Turning Rolls lead all others in long life, ruggedness, precision and dependability.

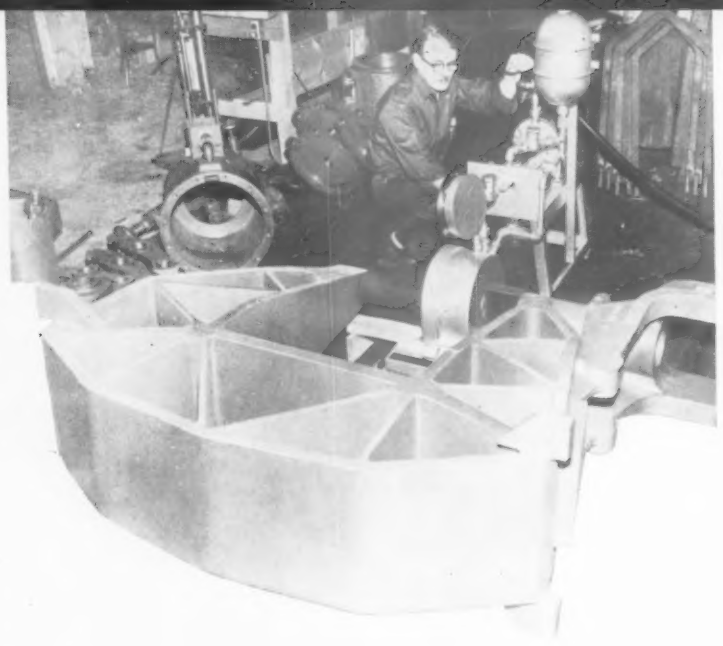
Your profits are built on dependability and dependability is our middle name.

ARONSON BUILDS THE MOST COMPLETE LINE OF POSITIONERS ...WITH CAPACITIES RANGING FROM 25 POUNDS TO 600 TONS

Universal Balance® Positioners • Bench Turntable Positioners
Gear Driven Positioners • Headstock-Tailstock Positioners
TracTred® Turning Rolls • Turntables • Fully Automatic Positioners
Geared Elevation Positioners • Magnetic Welding Clamps

Write for detailed engineering data

Aronson MACHINE CO., INC.
ARCADE, NEW YORK



YOKE-type 80-ton riveter cast-weldment structure undergoes pressure test on the nose section, at left, and the head section at right.

Weldment-casting design improves riveters

TO ECONOMICALLY PRODUCE 80-ton yoke riveters, engineers at Hanna Engineering Works, Chicago, are now designing for manual metal arc welding.

The riveters had previously been made from a single heavy steel casting to insure the strength necessary for working pressures of 30 to 175 tons or more.

Each riveter is now composed of a nose section casting, a head section casting (both of alloy steel) and a welded steel frame.

The 2,250-lb frame section is made of hot rolled steel plate stock 16-in. wide, ¾-in., 1½-in. or 1¾-in. thick, with 4-in.-square bars for intersection blocks.

Frame elements are manual metal-arc welded while positioned for gravity flow. For the root passes, E-7018 low-hydrogen iron powder electrodes are used, followed by scarf welds with E-6020 electrodes. For all fillet welds, E-7024 electrodes are used.

All welds are made with 100% penetration so they equal, or exceed, plate section areas.

The 925-lb head casting is made of medium carbon steel while Falk Moly telastic steel is used for the 225-lb nose casting, half of which is differentially heat treated, quenched and drawn to give 285 to 310 BHN hardness.

Both the castings and the welded frame are preheated before being welded with E-6020 electrodes.

The total 3,400-lb weldment-casting is then heat-treated in a 1,175 F furnace and normalized to relieve stresses in the metal created by welding and earlier heat-treating.

Forces of 160,000 to 240,000 lb are then applied, equal to a 50% overload, with a deflection of 15/32 in. Hydraulic forces of 80 tons are applied to the nose and head sections with a deflection of 5/16 in.

As a final step, the operating mechanism is applied and the riveter is ready for operation.

Hanna engineers cite these five reasons for using fabricated weldments instead of a single large casting:

1 — Welding costs less than producing a single large casting.

2 — Welding eliminates the need for large, bulky patterns for sand castings which are expensive to build, store, maintain and insure.

3 — Design flexibility is attained because head and nose section castings may be fitted to various size welded frame sections.

4 — Welded design permits the nose section casting, which is under great strain on the riveter, to be heat-treated separately for hardnesses impossible to obtain when the total assembly is made from a single casting.

5 — The welded riveter can be fabricated on a custom order basis in about a month. A riveter made from a single casting of the size needed often requires two or three months to schedule.

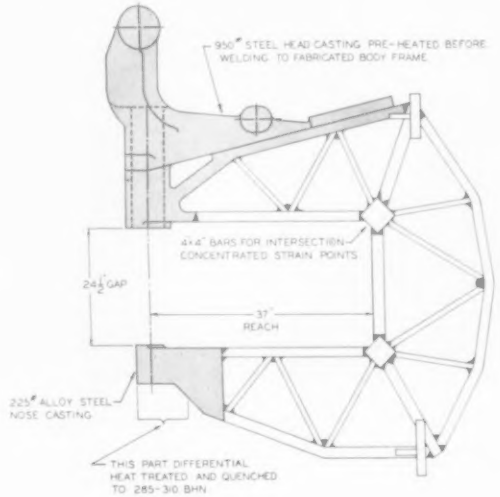
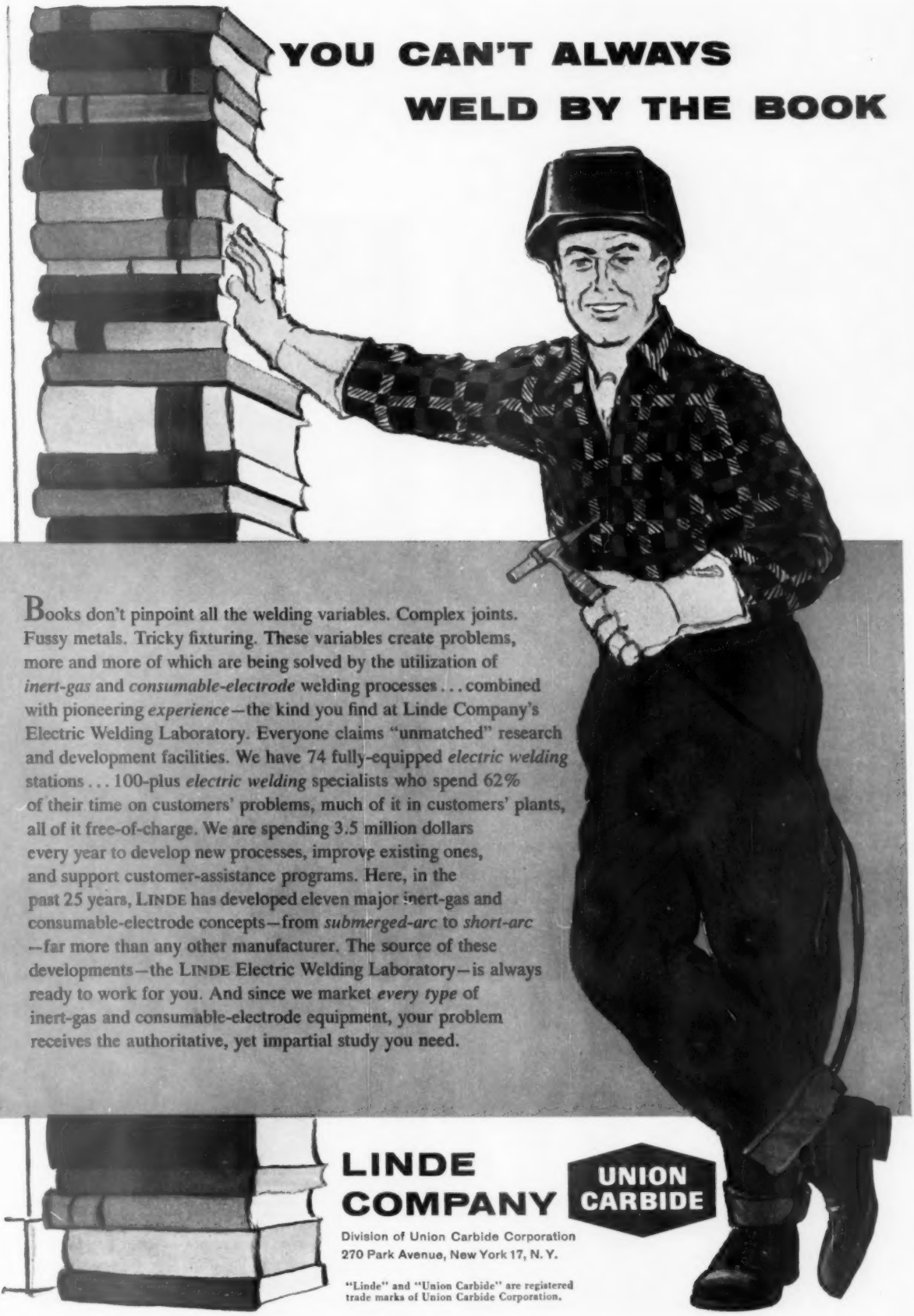

950# STEEL HEAD CASTING PRE-HEATED BEFORE WELDING TO FABRICATED BODY FRAME
4"x4" BARS FOR INTERSECTION-CONCENTRATED STRAIN POINTS
24½" GAP
37" REACH
225# ALLOY STEEL NOSE CASTING
THIS PART DIFFERENTIAL HEAT TREATED AND QUENCHED TO 285-310 BHN

DIAGRAM of weldment - casting of 80-ton riveter.

YOU CAN'T ALWAYS WELD BY THE BOOK



Books don't pinpoint all the welding variables. Complex joints. Fussy metals. Tricky fixturing. These variables create problems, more and more of which are being solved by the utilization of *inert-gas* and *consumable-electrode* welding processes . . . combined with pioneering *experience*—the kind you find at Linde Company's Electric Welding Laboratory. Everyone claims "unmatched" research and development facilities. We have 74 fully-equipped *electric welding* stations . . . 100-plus *electric welding* specialists who spend 62% of their time on customers' problems, much of it in customers' plants, all of it free-of-charge. We are spending 3.5 million dollars every year to develop new processes, improve existing ones, and support customer-assistance programs. Here, in the past 25 years, LINDE has developed eleven major inert-gas and consumable-electrode concepts—from *submerged-arc* to *short-arc* —far more than any other manufacturer. The source of these developments—the LINDE Electric Welding Laboratory—is always ready to work for you. And since we market *every type* of inert-gas and consumable-electrode equipment, your problem receives the authoritative, yet impartial study you need.

LINDE COMPANY

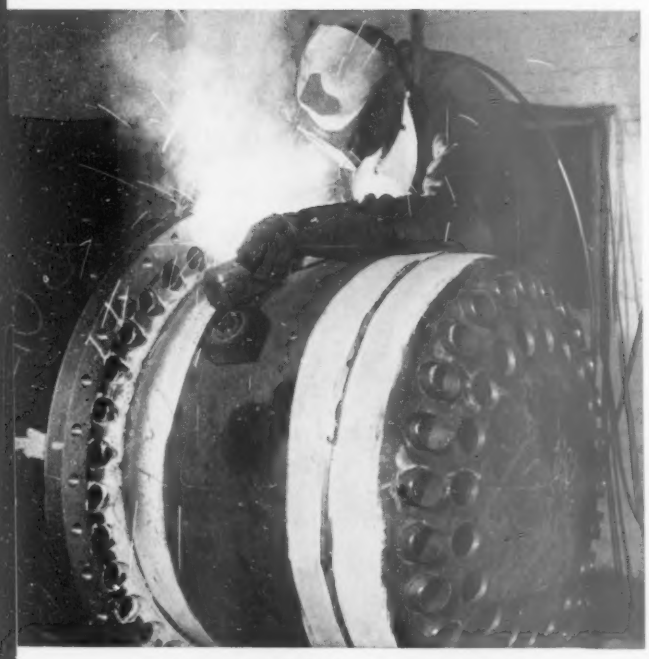
UNION CARBIDE

Division of Union Carbide Corporation
270 Park Avenue, New York 17, N. Y.

"Linde" and "Union Carbide" are registered trade marks of Union Carbide Corporation.

For more facts Circle No. 176 on Welding Info-Aid Card

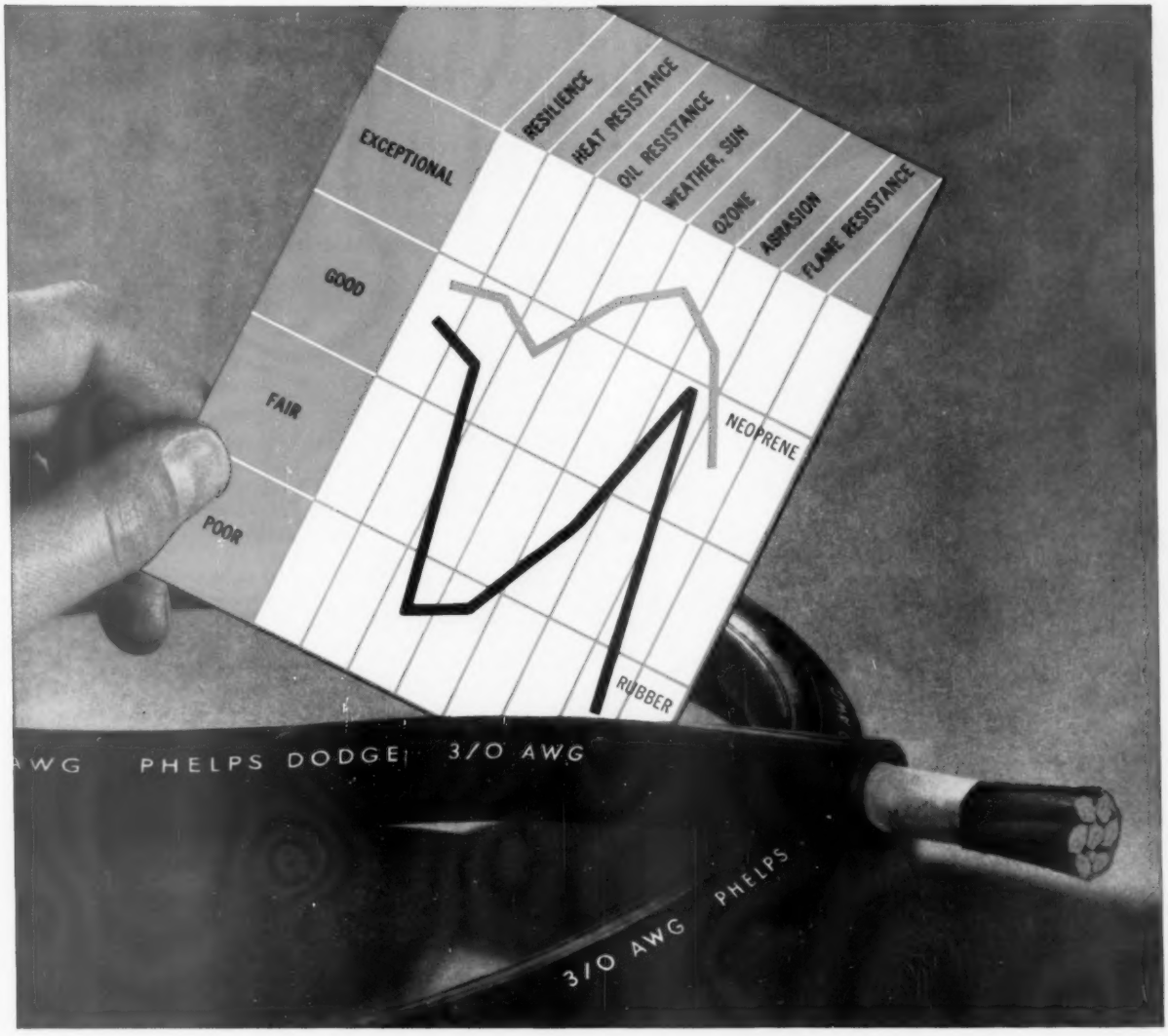
On the job . . .



WELDOR at the Henschel-Werke G.m.b.H., Kassel, West Germany, manual metal arc welds a boiler. The firm designs and manufactures oil or gas heated fully automatic firebox water tube boilers.

THREE chair frames per minute are welded on this three-position rotating Mig fixture devised by Queen City Dinettes Corp., Cincinnati. Semi-automatic Mig equipment, made by Westinghouse Electric Corp., Buffalo, N. Y., uses 0.035-in. wire in a 98% argon, 2% oxygen shielding gas mixture.

DEMOLITION of the old Cleveland Press Building, Cleveland, is expedited by using cutting torches made by The Harris Calorific Co., Cleveland. Propane and oxygen were used. Torch cut up to 1½-in. steel.



For True Welding Economy . . .

Consider the longer-wearing qualities of Phelps Dodge Habirprene Arc Welding Cable!

Specifying Phelps Dodge Habirprene (Neoprene) arc welding cable is a sure way of reducing your yearly welding cable costs. Habirprene welding cable outwears rubber cable —in most applications lasts many times longer under the severest working conditions. Chart (above) shows proof of Habirprene cable's sturdiness and durability.

Welders prefer the easy-to-use features of Habirprene cable. Its outstanding flexibility and rugged strength make handling easier on jobs where the cable undergoes extreme physical wear and tear. Habirprene cable meets the full requirement of A.S.T.M. D752.

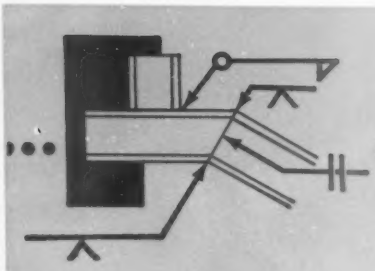
See your authorized Phelps Dodge distributor for this superior welding cable with the indelible gold marking.

Phelps Dodge also makes a full line of rubber arc welding cables and welding power supply cables. All these cables are available from stock.

PHELPS DODGE COPPER PRODUCTS
CORPORATION

SALES OFFICES: Atlanta, Birmingham, Ala., Cambridge, Mass., Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Dayton, Denver, Des Moines, Detroit, Fort Wayne, Honolulu, Houston, Indianapolis, Jacksonville, Kansas City, Mo., Los Angeles, Memphis, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Ore., Richmond, Rochester, N. Y., San Francisco, St. Louis, Seattle, Tampa, Washington, D. C.

MINE TO MARKET



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Don't overlook dip brazing

WHEN FABRICATING INTRICATE aluminum components which are uneconomical or impossible to produce with standard procedures, don't forget dip brazing.

The process involves the permanent joining of detailed aluminum extrusions, castings, forgings or machine pieces by placing a non-ferrous filler alloy between the parts and dipping the entire assembly into a molten flux to induce capillary flow of the filler.

Besides economy and design freedom, the process offers additional advantages of (a) high penetration resulting in joint strengths 80% of parent metal, and (b) structural uniformity through the stable temperatures used which minimize warpage and distortion.

Several basic factors must be considered when designing a unit for dip brazing, according to Precision Dipbraze, Inc., North Hollywood, Calif. These are:

Self-jigging — Assemblies to be dip brazed should be self-jigging and permit use of tabs, pins, clips or tack welds to obtain alignment during assembly and to hold sections together for the brazing process. Interlocking parts are ideal.

Joints — Joint clearances of 0.003 to 0.006 in. produce best results. Complete filler penetration and flux displacement can not be obtained in wide gap joints. Therefore, the width of the brazed joint should be held to a minimum, and butt joints should be avoided because they do not provide comparable strength.

Filler material — Either shim, powder or wire alloy filler can be used for dip brazing and should be considered at the design stage.

Venting — Each joint must be designed to permit liquid flux to pass freely through all areas of the joint. Gases generated by the process must have complete freedom to escape.

Heat treating — Assemblies fabricated from heat-treatable alloys can be re-heat treated by using normal procedures or by quenching and aging after the brazing cycle.

Material selection — Dip brazing is applicable for such non-heat-treatable aluminum alloys as 1100 and 3003, and for heat-treatable 6061, 6062, and 6063 as well as for certain castings.

The dip brazing process requires five distinct and carefully controlled steps.

1. Parts are inspected for burrs and obstructions that might impede brazing filler flow and are then chemically cleaned to remove void-producing contaminants.
2. Segments are assembled according to detail drawings and filler alloy is carefully positioned. When necessary, a stop-off material is used to prevent flow into undesired areas.
3. Assemblies are preheated to near-brazing temperature to reduce possible distortion.
4. Heated assemblies are immersed in molten flux for a predetermined length of time to induce capillary action of filler alloy.
5. Brazed assemblies are then cooled and subjected to a series of baths for flux removal and cleaning. The completed unit is then inspected and ready for post heating or finishing as required.

A Profit Angle

In some areas, corrosive water quickly destroys bottoms on pressure units such as water tanks, boilers and softeners. By flame-cutting a few inches off of the bottom of these pressure units, and welding on a new 3/8-in. steel plate bottom, Harvey Muller has done a profitable business with rural residents around Danboro, Pa. The customer gets renewed life of the unit at a fraction of the cost of replacement.

For more facts Circle No. 178 on Welding Info-Aid Card →

Jetweld Low Hydrogen Electrodes were used to make the welds in this costly complex of refinery pipes. Not only were they made fast, which is important to low costs, but they were made right. Tight. Porosity free. Crack free. Lincoln makes three **Jetweld Low Hydrogen** electrodes. Read inside how they can improve weld quality, speed your work, cut your welding costs.

These are Lincoln JETWELD low hydrogen electrodes on the job

By using high yield point alloy steel rather than carbon grade in these structural columns, architect was able to reduce column size 75%. This reduced building cost, increased rentable floor space. **Jetweld LH-70** electrodes were chosen to make the butt welds because of their ability to produce dense, crack-free joints on alloy steels.

These gasoline storage tanks represent excellent examples of how **Jetweld Low Hydrogen** electrodes can be used to save money in vertical welding on fairly heavy plate. Plus these values . . . no underbead or micro-cracking . . . dense and porosity-free welds. With **Jetweld LH** electrodes you can use high currents, get high deposition rate and bead size.

With any combination of the three Lincoln **Jetweld Low Hydrogen** electrodes, **LH-70, LH-90** and **LH-110**, you can weld all kinds of joints in all positions on any hard-to-weld steels from high carbon to T-1 steel. Each **Jetweld** handles essentially the same way, welds well in all positions. Only difference among the three is physical properties which conform to the AWS specifications for 70-, 90-, and 110,000 psi class electrodes. With each of them, you can actually weld heavy plate faster and at less cost than with ordinary mild-steel electrodes. And, you'll get better welds that are crack-free, porosity-free and X-ray quality.

LINCOLN ELECTRODES

Although **Jetweld LH-70** electrodes do cost slightly more than regular 6010-11 electrodes, their use can actually reduce the finished cost even in vertical welding, particularly on 5/8-inch plate or thicker. Why? Because you can use higher currents which produce a correspondingly higher deposition rate and bead size. These, in turn, reduce the number of passes necessary to complete the weld. **Jetweld Low Hydrogen** electrodes deliver better mileage — length of weld per electrode — too. Not the least important, **Jetweld** electrodes significantly reduce and often eliminate the need for costly, time-consuming pre-heating. This factor alone could rule out all other electrode possibilities on many applications.

Equip your shop with Lincoln **Jetweld Low Hydrogen** electrodes and you'll find there's no such thing as hard-to-weld steels. They handle large, tough jobs quickly, well, and at low cost. Want to know more about them? Why not let your Lincoln field engineer . . . a specialist in welding . . . fill you in. There's no obligation, of course. Or, you might prefer to check the next page for bulletins which will help you solve many of your electrode selection problems.

Pressure vessel components fabricated from heavy plate such as this can be done most economically and with confidence with **Jetweld Low Hydrogen** electrodes. You can count on **Jetweld LH** electrodes where code requirements call for X-ray quality. And costly pre-heating can be reduced, even eliminated on many such jobs.

Here, **Jetweld LH-70** electrodes are used to join the bottom flange of a beam to building column. The higher useable currents with these electrodes can increase the deposition rate and welding speed. And **LH-70's** ability to give perfect welds on off-analysis steel, so often delivered for structural use, is a great reassurance for contractors.

Call your Lincoln Welding Specialist, or write for these free guides to Electrode Selection!

Your Lincoln field engineer has helped solve thousands of welding problems in all kinds of industries. His time and talents are yours. Why not use them to help you decide the proper electrode to handle your needs, particularly when you have an immediate problem that demands all the know-how you can draw from.

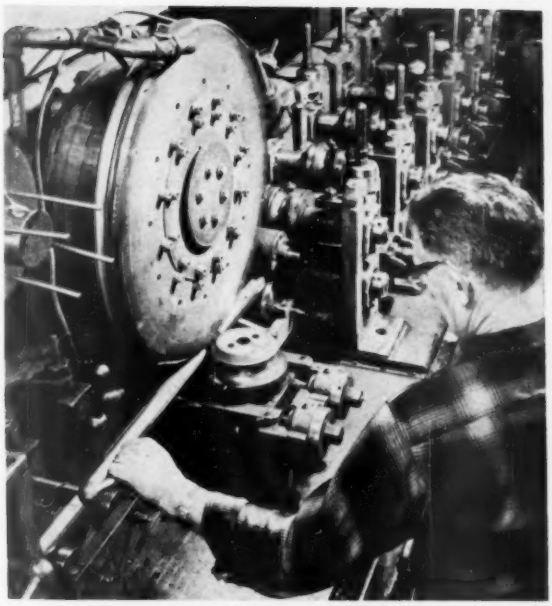
But for now, you may prefer simply to have a Lincoln Weldirectory or the newly-published Lincoln Electrode Selector Guide. The Weldirectory lists all Lincoln electrodes, discusses applications, techniques. The Electrode Selector Guide is a large 21½" x 33" wall chart which you can mount on your shop wall. It, too, lists all electrodes, applications plus an additional column which shows recommended machine current settings for each electrode and job type. Get either or both from your Lincoln specialist, or write today to:

LINCOLN ...USA

THE LINCOLN ELECTRIC COMPANY

Dept. WW-1812 · Cleveland 17, Ohio

The World's Largest Manufacturer of Arc Welding Equipment and Electrodes



ELECTRODE on toroidal electric resistance welder requires dressing only every two or three days.

Vapor-cooled transformer speeds pipe, tube welding

A NEWLY-DEVELOPED resistance welding transformer is increasing pipe and tube production while maintaining, and even reducing, power input requirements.

The key to the increased speed is a vapor-cooled transformer whose cooling system uses a non-toxic flourocarbon instead of recirculated water or oil. The cooling system operates by a heat build-up in the unit causing the liquid to vaporize and hit the transformer case where it condenses becoming liquid again.

This immersion cooling system plus compact design eliminate the secondary conductor system, thereby reducing secondary impedence and permitting current to be transmitted directly from the transformer to the electrode.

A prototype unit has produced 12-gage tubing at 80 fpm, 14-gage tubing at 106 fpm, and 18-gage tubing at 120 fpm under identical or greatly-reduced power input compared to conventional welders.

Using such a mill in production, one manufacturer is running 2-in. diameter 0.075-in.-thick steel tubing at 106 fpm and producing 3,700 pieces of 101¼-in. section or 6,000 pieces of 69½-in. section in an 8-hr shift. Only two operaters — one directing the continuous coil feed and one operating the welder — are employed on this auto and truck tailpipe production line.

Made by The Yoder Co., Cleveland, this tube and pipe mill with its vapor-cooled transformer offers several advantages:

1—Increased speed: Unlike water-cooled units, this mill can be pushed to capacity within the limits of insulation.

2—Reduced maintenance and downtime: Electrodes for the welder require dressing only every two or three days.

3—Reduced power requirements.

4—Complete self containment: There are no hoses, no rotating seals and no pumps. There is nothing to connect except the incoming power supply.

ONE MAN OPERATION

Time Saving • Money Saving
Man Saving • Dependable
Safe

NEW
Model ROX-24-LC

OFFERING . . .
- 3,500 lb Capacity
- 9 ft. Boom Extended
- Boom Telescopes for over road travel
- Rugged Construction
- Compact Design
- Vehicle mounted

VEHICLE BATTERY OPERATED

POWER HOSTS ✦ POWER BOOMS
✦ POWER ROTATES ✦

Write today for illustrated literature, specifications and price lists on all models of AUTO CRANE.

AUTO CRANE Company

1214 S. NORWOOD • TULSA 12, OKLA.

Never a strain-with Auto Crane

Circle No. 179 on Welding Info-Aid Card

Circle No. 180 on Welding Info-Aid Card

NEW, SENSITIVE HELIUM LEAK DETECTOR

LOCATES LEAKS

IN TANKS, PIPING AND OTHER FITTINGS

Can be calibrated for detecting hydrogen and other gases. Portable.

Industrial Instruments

Write today for complete technical details.

Industrial Instruments Inc.

89 Commerce Road, Cedar Grove, Essex County, N. J.

NO INJURIOUS FUMES . . .

ANTI-BORAX

No. 2 BRAZING FLUX

For Brass, Bronze, Copper, Steel, Malleable Iron, etc. Causes the bronze to penetrate deeper into the joint—making a stronger union than is possible with other fluxes. High efficiency makes it more economical to use. Melting point 300°.

ALSO

1—Cast Iron Welding Flux
3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux for Cast Aluminum Welding
7—Steel Flux
8—Aluminum Flux for Sheet Aluminum
9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys Dow Metal, etc.
16—Silver Solder Paste Flux

FOR THE BEST JOB AT LEAST COST

Welders can save more money and get a better job on production work, making special tools, and repair work with the right Anti-Borax product — order by number. Send for free sample and descriptive Circular.

ANTI-BORAX COMPOUND CO., INC.
FORT WAYNE, INDIANA

Circle No. 181 on Welding Info-Aid Card

Great Lakes Steel Corp.'s 80-in. hot strip mill nears completion on the banks of the Detroit River in River Rouge, Mich.

For huge rolling mill

3 miles of runway girders are submerged-arc welded

SUBMERGED-ARC WELDING HAS HELPED create what may be the fastest and most fully automatic rolling mill in the world.

This new 80-in. hot strip mill, being built at River Rouge, Mich., by Great Lakes Steel Div. of National Steel Corp., will be in operation this year. The mill covers a total of 20 acres and stretches in six parallel aisles spearheaded by the main hot strip mill extending 2,160 ft.

One major project in building the mill was fabrication of 17,200 ft — over three miles — of runway girders capable of supporting fast moving cranes with up to 125-ton capacities. Runway girders are 88-in. deep for 48-ft spans and 102-in. deep for 65-ft spans.

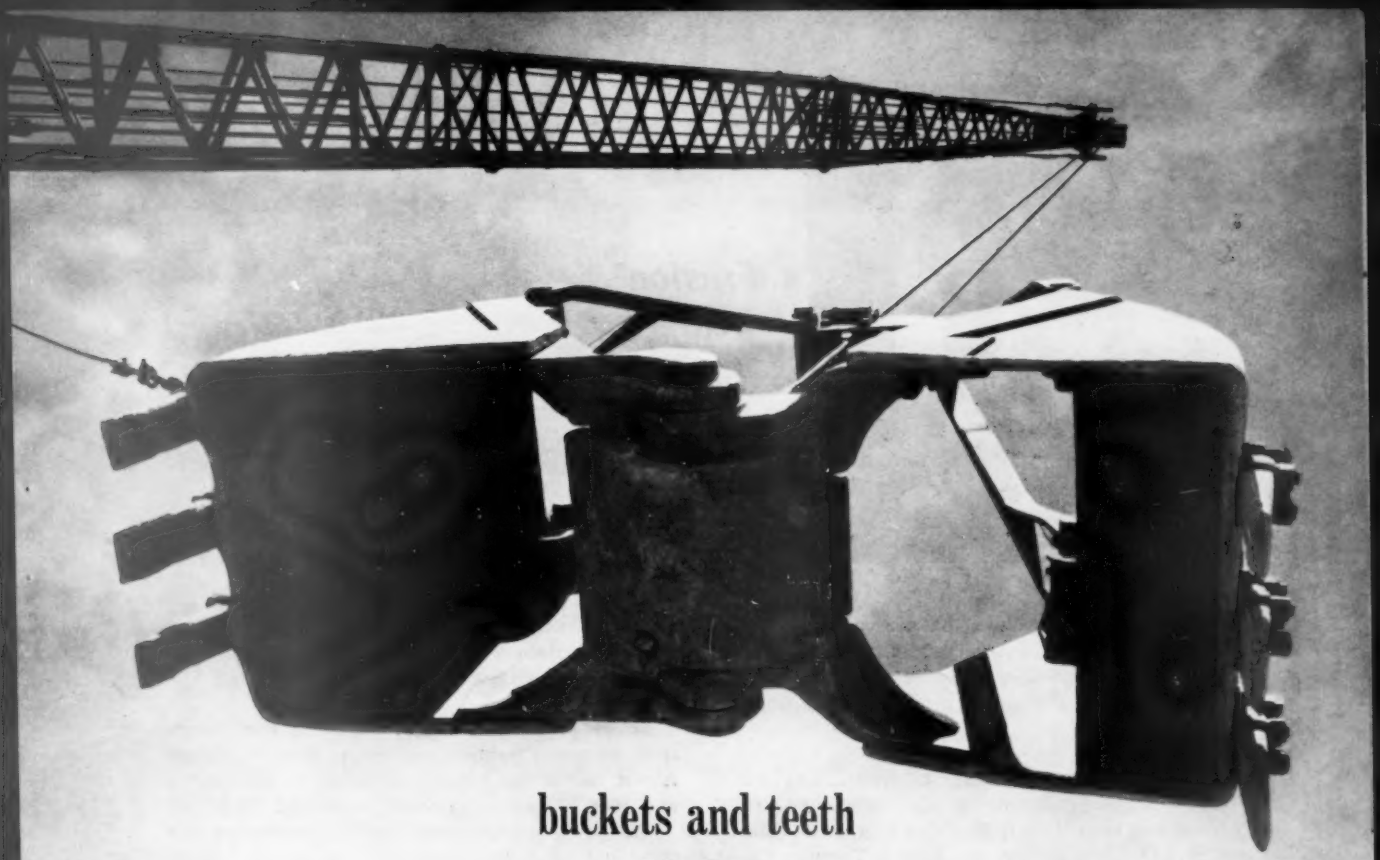
To fabricate these girders, a huge rail-mounted fully-automatic submerged-arc welder was used.

By serving two beds of girders set at a 45-deg angle on either side of it, the welder produced a single continuous 5/8-in. fillet weld on each web-flange plate joint, completing two girders in eight passes. The first girder was welded on the "up" run while the other was lifted from its bed, swung around and reset for the return pass.

The only manual metal-arc welding in this in-shop girder fabrication involved attaching web stiffeners.

In addition to the runway girders, all jack trusses and building columns were also welded. The trusses run alongside the crane girders and carry the intermediate columns used to support roof trusses. The welded jack trusses also provide a stiffening companion for long crane girders.

Aside from the strength advantages over other joining methods, welding saved important manhours by eliminating the need for: (1) riveting flange holes for angles and web-plates, (2) punching and reaming.



buckets and teeth
blades
tracks
sprockets
crushers

hardsurface it with an Airco Electrode or Wire —and do the job faster

You put your equipment back into action with confidence when you hardsurface it with an Airco electrode . . . or Airco automatic or semi-automatic wire.

Because the Airco line is *complete* you can always find an Airco electrode or wire designed especially to handle your most specialized job.

Does the job call for uniform hardness over the entire area, plus welder appeal? You'll find the right electrode or wire in the Airco line. Do you need an all position electrode or wire, with outstanding arc stability? You'll find it in the Airco line. Want to make maximum coverage? You get it with the Airco line.

To cut downtime . . . and lengthen the life of your costly equipment...hardsurface it with an Airco electrode or wire.

Special: — Send for a free copy of the new catalog, "Airco Hardfacing Electrodes and Wire." It illustrates 105 hardsurfacing applications, recommends the electrode or wire to use for each, gives characteristics and chemistry, and outlines procedure step by step. Never before has so much know-how been packed into such easy-to-read form.

Call Airco or look in your Classified Telephone Directory under "Welding Equipment and Supplies" for your nearest Authorized Airco Distributor.

Air Reduction Sales Company, 150 E. 42nd St., New York 17, N. Y.

Please send me the new Airco Hardfacing Electrode and Wire catalog.

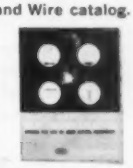
Name_____

Title_____

Company_____

Address_____

City_____ Zone_____ State_____



AIRCO

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated
150 East 42nd Street, New York 17, N. Y.

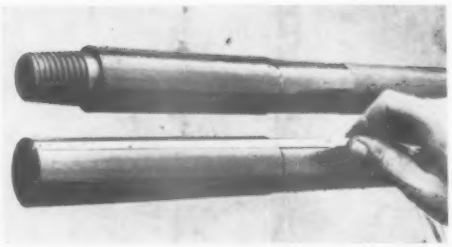
More than 700 Authorized Airco Distributors Coast to Coast

On the west coast—Air Reduction Pacific Co., **Internationally**—Airco Co. Int'l., **In Canada**—Air Reduction Canada Ltd. • All divisions or subsidiaries of Air Reduction Co., Inc.

For more facts Circle No. 182 on Welding Info-Aid Card

This prototype friction welder . . .

Friction welder fills an order



. . . joined tool joints like these to 30-ft tube lengths.

PRACTICAL FRICTION welding has arrived.

To fill an industrial order, the first commercial American friction welder has made 1,000 welds at a 20-weld-per-hr average to produce 15,000 linear feet of 1¼-in. tubing.

Welding of this special-joint oil well tubing was done by a prototype unit at the Oklahoma City plant of American Iron & Machine Works Co., Inc., a subsidiary of American Machine & Foundry Co.

Cost data from the production run indicate the friction welded joint is competitive with threaded-and-coupled and with pressure welded joints. Speeds, which contributed to the low cost, are comparable to flash welding and exceed pressure and other welding methods.

Before production began, engineers spent more than six weeks welding and testing over 500 joints. About 100 of the joints were tested to destruction and over 400 were examined microscopically.

The prototype unit used in this production run grew out of a two-year AMF study of friction welding (See WELDING ENGINEER, Jan. 1961, p. 39). AMF is now designing improved versions of the production unit.

Top quality, low cost

DOCKSON OUTFITS

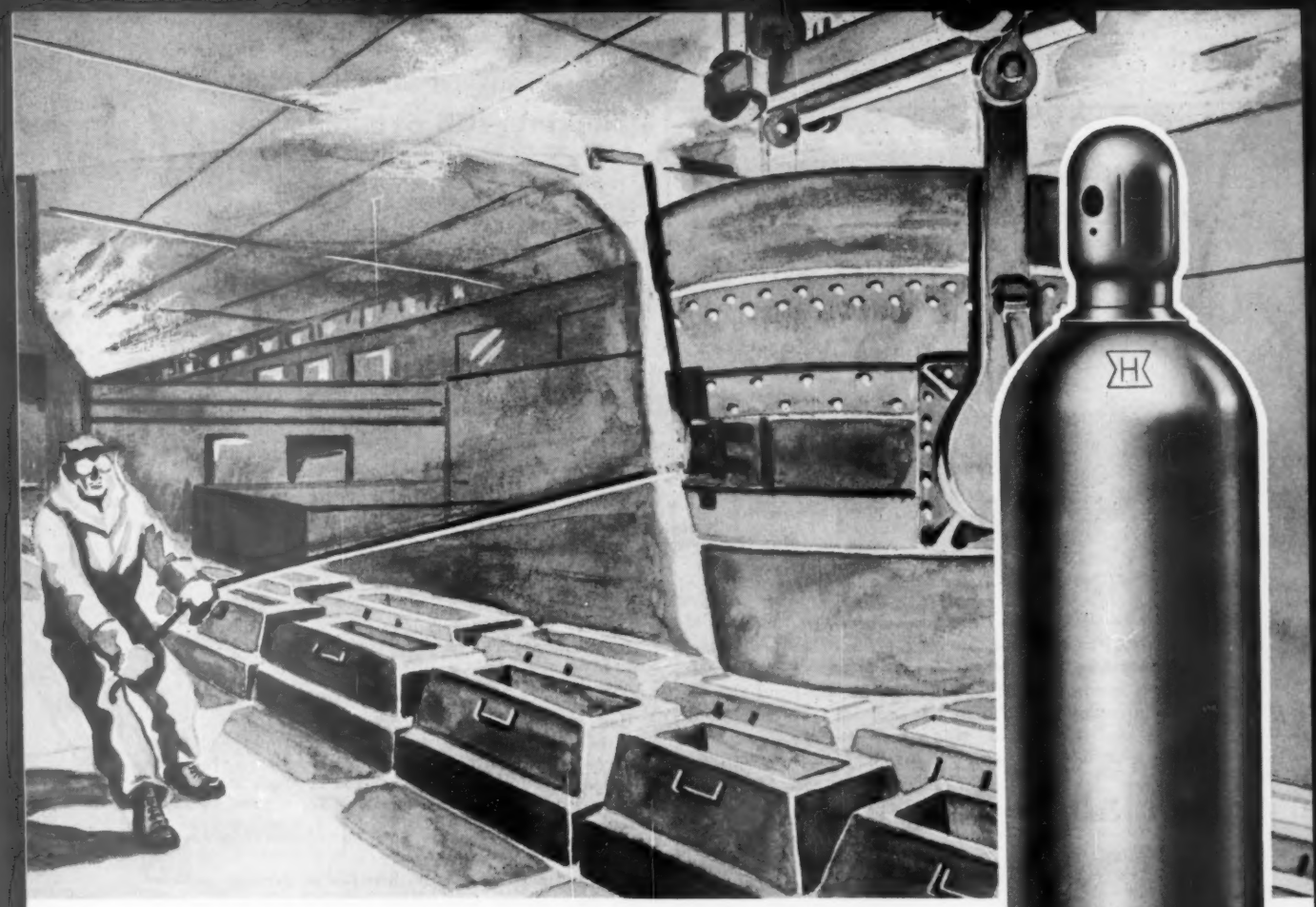
FOR WELDING AND CUTTING

Carefully engineered for quality, comfort, economy, and balance, Dockson's complete-package welding and cutting outfits are truly "built for better service."

Low cost Dockson outfits include all the equipment necessary to handle your complete welding or cutting job. All parts are stock catalog items and may be quickly replaced when necessary.

Dockson CORPORATION

Write for the name of your Dockson Distributor.
3839 WABASH AVE. • DETROIT 8, MICH.



FROM OPEN HEARTH FURNACE TO FINISHED CYLINDERS . . . . . .

PROSPECTIVE PURCHASERS OF GAS CYLINDERS may be interested to know that Harrisburg Steel produces for itself the major portion of the alloy and manganese steel required for its cylinder production.

These facilities make Harrisburg largely independent of outside sources of steel supply and provide great flexibility in the processing of orders, in the control of metal quality and in continuity of production.

If you are in the gas cylinder market (which you probably are if you read this ad) and you have a problem or a question or would like to buy gas cylinders write or call us.

HARRISBURG STEEL CO.

Division of HARSCO CORPORATION
HARRISBURG 8, PENNSYLVANIA

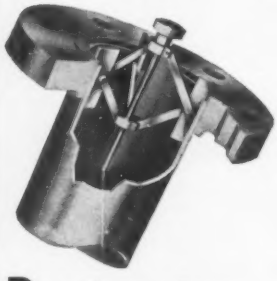
For more facts Circle No. 184 on Welding Info-Aid Card

CURV-O-MARK

Centering Heads

Actually, it's five tools in one — replaces protractor, centering head, center punch, level and scale. Y-Type head is accurately machined with tangents and tips to serve in centering and aligning. Dial Set Level is marked in 2½ and 10 degree graduations for easy reading Punch is of drill rod, with special point for long service.

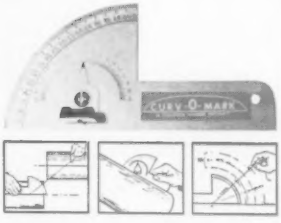
Flange Aligning Tool



This self-centering tool makes pipe line construction faster and more accurate. It is quickly adjustable for all type flanges or pipe sizes ranging from 3 to 12 inch diameters. After easy insertion into pipe, Flange Aligning Tool centers itself snugly against the inside pipe diameter and automatically aligns with pipe axis.

Protractor

The ANG-LO-CATOR Protractor is the only measuring device that quickly and accurately determines correct degree of angle on any pipe or structural material, regardless of size. A valuable aid to weldors, structural workers and pipe fitters. Size 4" x 8".



RADIUS MARKER

The Standard Radius Marker folds to pocket size. This sturdy, folding Radius Marker has a span of 24" and easily swings a 48" circle or arc.
The Jumbo Radius Marker is also the folding type, has a span of 48" and easily swings a 96" circle. These tools are precision made of rust proof aluminum Jural.
The Standard Radius Marker folded, measures only 9¼" in length, weighing only 8 oz. The Jumbo model, of course, is larger. Both are equipped with special spring washers to maintain accuracy and rigidity for years of service. Pencil holder is made to hold round or flat pencils, soapstone, or steel point.

CONTOUR SALES CORPORATION

1843 E. Compton Boulevard Compton, California

Reprints still available from WE

Reprints of certain articles published in Welding Engineer are still available. A list of these appears below. Reprints may be obtained for 15 cents each, except where otherwise noted. Payment must accompany all orders. For quantity orders, write for special prices. Order by title from: Reprint Editor, Welding Engineer Publications, Inc. Box 28, Morton Grove, Ill.

Design for welding

Basic knowledge required when designing or redesigning for welded construction is detailed and discussed. Sixteen page reprint includes 11 data sheets.

The meaning of weldability

Weldability of carbon steels and alloy steels, as well as some other metals, is discussed. Sixteen page reprint includes three data sheets.

How to weld T-1 steel

Explains how to weld this high-strength low-alloy metal. Includes a data sheet on T-1 mechanical properties.

Fundamentals of oxyacetylene welding

Gives the basic essentials on and primary steps of oxyacetylene welding.

Uses of build-up electrodes

As rebuilding and reclaiming of worn steel parts becomes standard maintenance procedure, build-up electrodes increase in importance. This 2-page reprint lists the qualities necessary for a good build-up material.

A guide to preheat

This 4-page reprint on benefits of preheat includes an engineering data sheet entitled "Recommended preheat for steel alloys."

Acetylene

A 12 page salute to the IAA and acetylene, details the great success of this gas. Includes a history of the IAA and "The Acetylene Journal."

Filler metals for brazing

Brazing filler metals are detailed and each group is analyzed. Includes data sheet on how to select silver brazing alloys.

Explosive welding and forming open another door

A report on one of the newest entries into the welding industry, and how one pioneer company turned theories and practices into realities.

Our modern-day mythology

A rebuttal to some old-wives tales about the hazards of welding fumes, plus safety recommendations for situations where hazards might develop.

Welding the reactive metals

This 12-page reprint describes techniques for Tig welding titanium, zirconium and tantalum. It also gives experimental data on resistance spot welding of tantalum.

Welding 17-4 PH stainless steel

Sound joints can be easily produced in 17-4 PH stainless by proper welding practice. This 4-page reprint details all phases of the procedure.

Non-destructive testing

Four separate articles comprise this 8-page reprint on non-destructive testing: how to interpret radiographs; circumstances and job requirements govern selection of radiation source in inspection; ultrasonic testing; and a program for radiation safety.

WELDING student, at left, receives individual training in Tig welding at the Tulsa Welding School.

Illinois, Oklahoma schools increase welding classes

FROM ILLINOIS TO OKLAHOMA, educators are becoming more aware of the need for well-trained weldors and welding technicians.

Both East Leyden High School, Franklin Park, Ill., and the Tulsa Welding School, Tulsa, Okla., have recently increased the scope of their educational services in welding.

When an area survey revealed that 377 weldors were employed in the immediate vicinity of Franklin Park and a demand for welding technicians was on the way, East Leyden quickly initiated a evening program in welding technology.

The high school, which has been offering basic welding courses for years, now offers these adult evening classes twice a week for four hours.

The six semester course includes such subjects as Welding Equipment, Welding Processes, Report Writing and Physics.

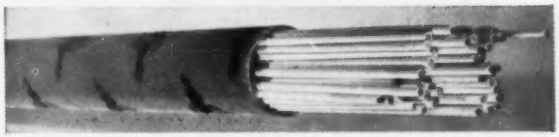
The Tulsa Welding School, on the other hand, was initially founded to help fill the growing demand for qualified weldors in pipeline and refinery construction and maintenance.

The Tulsa school now offers training in manual metal-arc, Tig and gas welding, with instruction on beveling and cut-off machines, layout and fabrication.

As part of their training, students at the Tulsa Welding School do practical work on the same welders used in the field. In addition, the school has installed a laboratory for training in testing procedures.

3 METHODS OF PRODUCTION BRAZING ...Which is best for you?

FLUX COATED ROD



A new brazing concept—engineered flux-coated bronze—thick and thin extruded coatings to fit maintenance or production needs.

Work goes fast and even with ALL-STATE's extra thin coated bronze type alloys. Flux is extruded evenly, at thickness of only .0065, to assure excellent control and easy clean-up. Narrow beads are obtained with consistent proportion of flux to rod. Coated rods are highly efficient, require minimum amounts of rod and flux.

BARE ROD AND FLUX

Welding time was cut 25% and clean-up time 75% by using All-State nickel-silver and separate flux when brazing 1" mild steel tubing in power saw frame production.

For the occasional job or where brazing operations change from time to time, ALL-STATE suggests that bare bronze with #41 or #1 flux is the most flexible method, providing maximum control of capillary flow. Recommended for deep joints.

Nickel-silver rod with #11 flux is a versatile combination for joining dissimilar metals. TS up to 80,000 psi.

The bare rod and flux method permits use of special fluxes for unusual applications.

AUTOMATIC FLUXING SYSTEM

World's largest industrial stapling machine manufacturer found solution to assembly problem with high-strength All-State #11 nickel silver and automatic Jet Flux production brazing systems.

The fastest method of surface brazing, and the most economical for production work, is automatic fluxing, available for bronze, copper and steel brazing alloys. ALL-STATE's system permits finger-tip control of liquid flux, is easy to use, requires minimum cleanup.

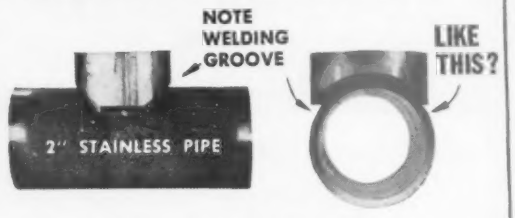
JET FLUX dispenser, approved by Factory Mutual, is simple to fill, operate, clean, and re-fill. Can be used to feed liquid flux in exact amounts through oxy-gas or air-gas systems. Save on fuel cost by using Liquid Jet Flux with oxy-propane or natural gas stepped up to 8 lb. pressure. Send for free information on how to adapt torch for these lower costing fuels.

ALL-STATE has quality rods and fluxes for all brazing methods. Send for folder on JET FLUX. Also free 56-page Instruction Manual and Catalog.

Distributors everywhere

All-State ALL-STATE WELDING ALLOYS CO., INC.
White Plains, N.Y. Dial 914 WH 8-4646
QUALITY WITH SERVICE

CAN YOU—IN YOUR SHOP—MAKE UP A WELD JOINT?

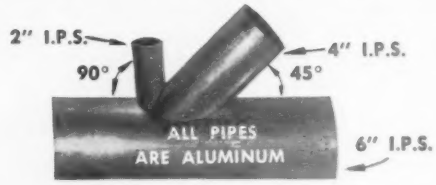


In less than 2 minutes?

CAN YOU THEN WITH NO DIE CHANGE MAKE THIS SET-UP?...

. . . and have both done in less than 4 minutes?

HOW WOULD YOU MAKE THIS ONE?



You could have made all 3 joints shown in *less than 15 minutes* with your

"De Witt Weld Joint Making Unit"!

You should have one! Investigate!
"How simple!" one customer said.

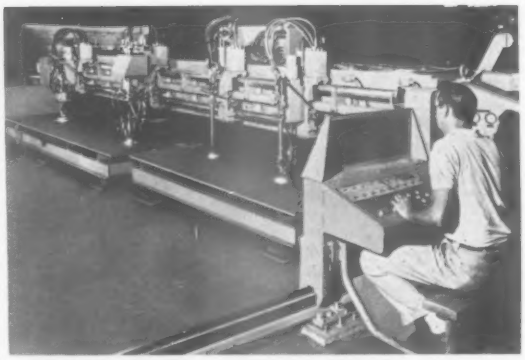
Ask for Ed De Witt

Phone me today!
Call me collect!
BUCKINGHAM 1-7000

My job is to make your job of weld joint preparation easier.

Or . . . write for a sample. (Tell me what joints you make)

WALLACE
SUPPLIES MFG. COMPANY
1810 W. Cornelia Ave. • Chicago 13, Illinois



FLAME - CUTTING machine, above, and numerical control system, right, are the main components of the new fully - automatic unit.

Tape-controlled flame cutter makes debut

NUMERICALLY-CONTROLLED tape flame-cutting machines are no longer in the talking stage.

Such a unit — thought to be the first of its kind in the United States (See March *Weld World*, p. 17) — has been developed by Air Reduction Sales Co. in cooperation with General Electric Co.

The four-torch rectilinear bridge-type unit cuts straight lines and contours with ±1/64-in accuracy in any length plate 22-ft wide and up to 6-in. thick.

The unit eliminates templates, template tables and reliance on an operator to control flame-cutting. After initial manual positioning, predetermined numerically-coded instructions provide fully-automatic flame-cutting control.

Even auxiliary functions such as starting and stopping, igniting preheat flames, flame control, gas supply control and cutting sequence are all programed on the tape.

Cutting speeds can be programed from 2 to 35 ipm. Programed traverse speeds for positioning between cuts range up to 150 ipm.

To prepare the tape, engineering drawings are first made for the part to be cut. Next a program, based on dimensional information, is devised from the drawings. This program is then transferred to paper tape by an automatic punch typewriter and the tape is ready to be inserted in the unit.

News

. . . from page 8

650 dealers attend 70 Lincoln Electric meetings

A total of 650 welding supply dealers attended 70 meetings recently held throughout the United States by The Lincoln Electric Co., Cleveland.

The meetings were concentrated in a 3-day period to introduce a new design welder for maintenance and small shop fabrication.

Continental Copper opens two wire and cable plants

Continental Copper & Steel Industries, Inc., Linden, N. J., has formally dedicated two new wire and cable plants which begin a projected multi-plant manufacturing complex.

Built at a cost of nearly $10 million, two plants consist of an electronically-controlled automatic copper rod rolling mill and an adjoining rubber mill and wire insulating mill.

Picker X-Ray forms industrial testing division

Picker X-Ray Corp., White Plains, N. Y., has formed a new division to design and produce individualized nondestructive testing systems for industry.

Donald T. Green, chief industrial applications engineer for Picker, has been named manager of this Special Products Division which will be located in Cleveland.

Hobart school schedules 4 welding courses

The Hobart Technical School, Troy, Ohio, has scheduled four intensive courses to be held in the fall and winter of 1961.

Courses will be: Oct. 9-13, Arc Welding Inspection and Quality Control; Nov. 13-17, Welding Fundamentals for Supervisors and Engineers; Nov. 27 to Dec. 1, Automatic Welding for Management; and Dec. 4-8, Gas Shielded Arc Welding Processes. For more information write to: Hobart Bros. Technical School, Box DM-194, Troy, Ohio.

Circle No. 207 on Welding Info-Aid Card

APPROVED BY CUSTOMERS, REGULATORY AGENCIES, WORKERS! INCREASES PRODUCTION AS MUCH AS 35%!
Precision engineered to highest standards — ENGWALD's superior exhaust systems have won the endorsement of welding shops, garages, factories and plants . . . and the approval of State and City Labor, Health & Hygiene Depts.
FOR EVERY INDUSTRIAL PURPOSE . . . EVERY SPECIAL JOB — whatever your problems ENGWALD can fill your needs. And ENGWALD units are backed up by many years of experience.
FREE ENGINEERING SERVICE. Let a skilled Engwald engineer help you in determining your needs and designing a suitable ventilation system for you. Write today for descriptive catalog.

engwald
THE WORLD'S FINEST EXHAUST SYSTEMS
125 Sheridan Blvd. Inwood, Long Island, N. Y.
FRanklin 1-2222

ROBVON BACKING RINGS

APPROVED FOR WELDING PIPE, VALVES, AND FITTING JOINTS

ROBVON TYPE "CCC" BACKING RINGS

PATENT NOS.
3366579
2764426

EXCLUSIVE WITH ROBVON

Designed for quick easy alignment of pipe where the variation in inside diameters is relatively great. Chamfered NUBS allow close tolerance fit-up and CLEAN STRIKE OFF. The ROBVON NUB automatically sets root gap. ROBVON rings are beveled to assure non-restricted fluid flow. Available in Carbon Steel, Wrought Iron, Chrome Alloys, Stainless Steel and Aluminum.

ROBVON BACKING RING COMPANY
675 GARDEN STREET • ELIZABETH, NEW JERSEY phone EL 2-9613

ARCAIR executives study sketch of new building under construction. Seated at left is E. J. Lehmkuhl, sales manager, and at right, M. D. Stopath, president. Standing, from left, are W. J. Coughlin, J. N. Gaskins, and H. R. Henderson.

Arcair starts construction of new building

Arcair Co., Lancaster, Ohio, has started construction of a new plant which will triple existing facilities.

The one-story structure, scheduled for completion in August, will be located on an 8-acre site near Lancaster. The building will provide complete manufacturing, office and warehouse facilities and will include enlarged laboratory facilities.

The plant will have its own 500-kva maintainable substation to furnish power and an independent water supply and sewage disposal plant.

Joint venture builds North Carolina bank

The North Carolina National Bank building being erected in Charlotte, N. C., (see *WE*, May, 1961, p. 50) is the joint effort of the following firms:

Architects: Walter W. Hook & Associates; structural engineer: R. V. Wasdell; fabricators: Southern Engineering Co., and Bristol Steel & Iron Works, Inc.; general contractors: Southeastern Construction Co., Goode Construction Co., and Thompson & Street.

Midstate Welding installs NCG oxygen converter

A new liquid oxygen pumping station to provide a continuous supply of gaseous oxygen to customers has been installed at Midstate Welding Supplies, Flora, Ill.

The unit was installed by the National Cylinder Gas Div. of Chemetron Corp., Chicago.

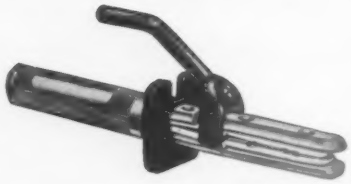
National Ultrasonic moves to new manufacturing site

National Ultrasonic Corp., Nutley, N. J., has moved into larger manufacturing facilities.

The new plant provides approximately 15,000 sq ft of manufacturing area and 3,000 sq ft of office and engineering space.

DURO ELECTRODE HOLDERS

THE DURO "STANDARD"



* Featuring "Long Jaw Design" for reaching hard to get at places.
* Cool operation-cool handling.
* Insulated handle and guard protects the operator.
* All parts easily replaced.

THE "ADJUSTABLE TENSION"

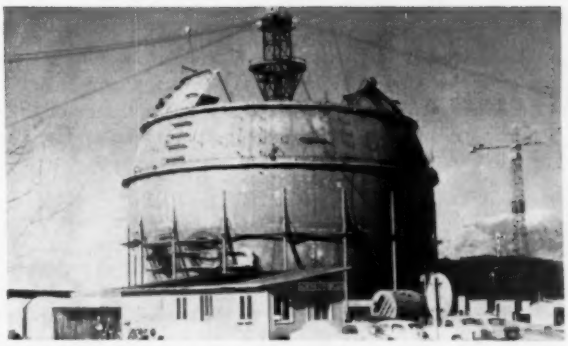
* Easy adjusting of Spring Tension for your requirements.
* New type cable connection prevents fraying of cable.
* Aluminum model weighs only 13 oz.
* All parts replaceable including copper alloy jaw.

For further information write:

THE DURO MANUFACTURING COMPANY

71 Oregon Avenue, Hamden 17, Connecticut

In Summary . . .



Chicago Bridge & Iron Co.'s British subsidiary, **Chicago Bridge, Ltd.**, London, is completing an atomic reactor containment vessel (see cut) for a 150,000-kw nuclear power plant near Naples, Italy. The vessel is a 160-ft-diameter steel Hortonsphere. . .

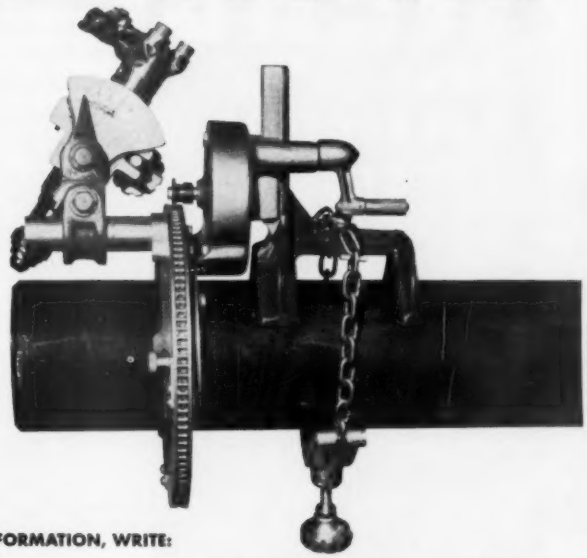
Martin Co., the missile manufacturer, has purchased 90,000 common shares of **Epsco, Inc.**, Cambridge, Mass., and now holds 14% of the electronics firm's 625,000 outstanding shares . . . Giant radar reflectors will be explosively formed by **Sylvania Electric Products Inc.**, Waltham, Mass. The aluminum mirrors for military installation will be 78 in. in diameter and 22-in. deep. . .

The Atomic Energy Commission has withdrawn from the routine production and distribution of cobalt-60. Cobalt-60 in sufficient quantity to meet ordinary demands is being produced by **Westinghouse Electric Corp.** and **General Electric Co.** . . . **National Tank & Boiler Co.**, Hazelwood, Mo., has just celebrated its 10th year in the fabrication business . . . **United Welders, Inc.**, Bay City, Mich., has formed a new division, **United Machines and Engineering, Inc.**, Fort Smith, Ark. The new division will specialize in equipment handling and transfer of in-process workpieces. . .

RIGID! ACCURATE!

CROSE-PERRAULT MODEL "O" BEVELING MACHINE

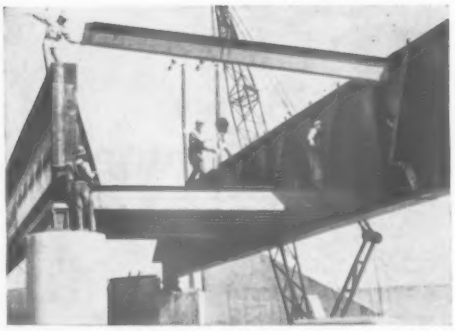
Crose-Perrault's small size model "O" beveling machine will cut and bevel small diameter coated pipe from 1½" to 4". Only one adjustment necessary to change pipe size settings. A full circle traveling ring cuts and bevels pipe simultaneously to assure accuracy. This ring eliminates jerky movement and insures a cut so smooth that buffing costs are negligible. Easy to install on closed section of pipe. Light weight, rigid, constructed of finest aluminum alloy.



FOR MORE INFORMATION, WRITE:

Crose perrault EQUIPMENT CORP.

2765 Dawson Road • Phone WEbster 6-2171 • Tulsa, Oklahoma • BRANCH OFFICES: Houston, Texas • Elizabeth, New Jersey • IN CANADA: CROSE-PERRAULT CANADA, LTD., Edmonton, Alberta • Toronto, Ontario • EXPORT OFFICE: New York, N. Y. • CABLE: CROSE



To prevent loose rock from falling from rail cars on the North Victorville Underpass in California, engineers called for the bridge to be welded near the lower flange of the deep girders (see cut). Arc welding equipment from **The Lincoln Electric Co., Cleveland,** was used for the job . . .

C. A. Schrader Welding Supplies, Inc., Mishawaka, Ind., dealer for the **National Cylinder Gas Div. of Chemetron Corp.,** Chicago, has added 10,000 sq ft to its store area and has purchased a new truck to serve Michigan City, Elkhart and LaPorte, Ind. . . .

T A B Engineers, Inc., maker of special machine designs and automated production lines, has moved to 520 N. Michigan Ave., Chicago 11, Ill. . . . A 35-ton rolling mill has been installed at **Carnegie Institute of Technology,** Pittsburgh, as a research tool for the department of mechanical engineering . . .

Seco Electronics, Inc., Minneapolis, has been purchased by **Di-Acro Corp.,** Lake City, Minn. Seco, now a wholly-owned subsidiary of Di-Acro, will continue to operate with present management under its own name. . . **NCG Canada Ltd.,** Edmonton, is the new name of the firm previously known as **Alberta Oxygen & Acetylene Co., Ltd.** NCG Canada is a subsidiary of **Chemetron Corp.,** Chicago. . .

WEBB

TANK PRODUCTION MACHINERY

Horn Jigs
Offsetters
Seam Welders
Turning Rolls
Track Supports
Assembly Presses

Model M-2 with rotating turntable for reversing ends when both ends are to have offset flanges.

Complete catalog on any type or size machine furnished on request.

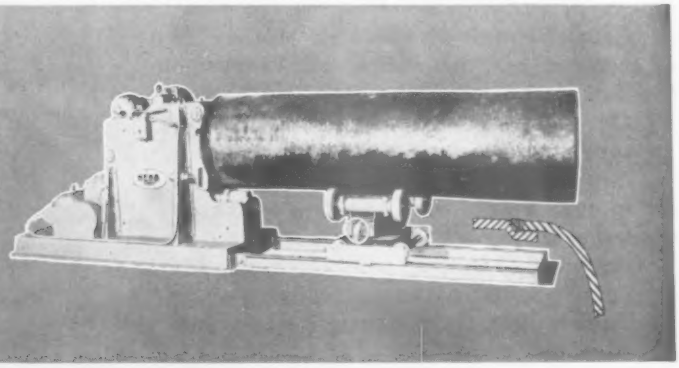
Since 1881
THE WEBB CORP.
REED EQUIPMENT DIVISION
WEBB CITY, MO. U.S.A.

WEBB OFFSETTER

for forming an offset flange around shell ends to facilitate automatic welding of tank heads.

- Eliminates chill rings
- Improves concentricity of shell ends
- Shortens fit-up time
- Helps reduce welding time

Available in four models to handle up to ½″ plate.
With standard dies.
New M 2-P pipe duty 6″ to 30″ up to ¼″ thick.



WEBB ASSEMBLY PRESS

Companion fixture for assembling heads to shells — shells to shells.
• 25 tons closing pressure • Built-in fit-up rolls • Built-in kick-out lift • Adjustable for tank diameter and length
3 standard sizes to handle up to 72″ diameter
Combination Assembly and Girth Welding Machines also available.

VIPs in review . . .

Frederick C. Kroft has been appointed staff assistant to the president of Haynes Stellite Co., Div. of Union Carbide Corp., New York City. Replacing Kroft as works manager for the firm is **Glen H. Shelton.**

Kroft

Shelton

L. A. Thesenga has joined Buettner Welding Supply Co., St. Paul, Minn. Thesenga had been with Smith Welding Equipment Corp., Minneapolis, for 22 years.

A. O. Smith Corp., Welding Products Div., Milwaukee, has appointed **W. V. Raszka** as sales engineer in the Mid-East and **J. F. Colosimo** as sales engineer in Detroit.

Robert D. Wylie has been named director of the department of materials engineering of Southwest Research Institute, San Antonio. Wylie was formerly quality control manager for the boiler division of the Babcock and Wilcox Co.

Clyde J. Hicks has been named assistant dealer relations manager for the industrial gas section of the National Cylinder Gas Division of Chemetron Corp., Chicago.

L. L. Stuart has been appointed service operations manager of Skil Corp., Chicago.

Roger Gabbei has been promoted to Midwest regional sales manager for Amperex Electronic Corp., Hicksville, L.I., N.Y. Gabbei will headquarter in Elmwood Park, Ill.

William F. Aylard, formerly director of engineering, has been named a vice president of Chase Brass & Copper Co., Waterbury, Conn. Aylard will be responsible for coordination of research, engineering and product development.

Charles W. Willwerth has been appointed district sales manager of industrial gas in New England for Liquid Carbonic Div., General Dynamics Corp., Chicago.

Thomas W. Young has been appointed assistant general superintendent of United States Steel Corp.'s National Tube Division Gary, Ind., works. He succeeds **William H. Hall** who has been transfered to a similar position at the division works at Ellwood City, Pa.

Charles G. Herbruck has been appointed secretary of the James F. Lincoln Arc Welding Foundation, Cleveland. Herbruck has been assistant secretary since 1947 and acting secretary since the death of A. F. Davis.

Herbruck

Purdy

In the Westing-Arc Dept. of Westinghouse Electric Corp., Buffalo, N. Y., **Fred J. Purdy** has been appointed sales manager and **Philip W. Mahin** has been named as his administrative assistant. At the Westing-Arc Dept. plant at Motevallo, Ala., **E. H. Turnock** has been appointed senior engineering consultant to the manager of engineering and **Gail E. Saur** has been appointed supervisor of the engineering section.

Circle No. 192 on Welding Info-Aid Card

TO FABRICATE STAINLESS WELD IT WITH AIRCO-MATIC

AIRCOMATIC® welding is the lower cost way to fabricate. Weldments show excellent ductility, tensile, and impact properties. Tailored to the process, Airco's wide range of Aircomatic stainless wires can be used for welding all standard alloy types. Remember: Only Airco makes everything you need for stainless welding.

AIRCO AIR REDUCTION SALES COMPANY

A Division of Air Reduction Company, Incorporated, 150 East 42nd Street, New York 17, N. Y. • On the west coast — Air Reduction Pacific Company • Internationally — Airco Company International • In Canada — Air Reduction Canada Limited • All divisions or subsidiaries of Air Reduction Company, Inc.

Eisler makes the largest assortment of precision press type welders, spot, wire butt, seam, tweezers gun and flash welders. We also carry in stock a large assortment of welding tips and accessories.

EISLER ENGINEERING CO., INC.
749 S. 13th Street Newark 3, N. J.

Circle No. 193 on Welding Info-Aid Card

"Our weldors sure do like to work with that new Murex AC machine..."

That's what everybody seems to be saying wherever the M&T Murex AC Industrial Arc Welder gets put on the job. No wonder. It's designed for easy handling and dependable service, with . . .

Just one inch of shunt travel for entire current range. Rigidly mounted shunt for quiet, chatter-free operation. Fast, single crank heat control. Patented dual-coil transformer in a balanced circuit for smooth, steady arc under all welding conditions. High open circuit voltages for instant starting of arc with all types of electrodes.

Write for data sheet. METAL & THERMIT CORPORATION, General Offices, Rahway, New Jersey.

M&T MUREX

AC ARC WELDER

Circle No. 194 on Welding Info-Aid Card

After completing a one - year training course, **Jack B. Paskins** and **James W. Rosenthal** have been appointed to the staff of field engineers for The Lincoln Electric Co., Cleveland. Paskins is assigned to Albany, N. Y., and Rosenthal to Pittsburgh. **David B. Reader** has been transfered from Albany to Dayton. The Lincoln Electric Co. has also appointed **Donald A. Dumuth** to its staff of field engineers. Dumuth has been assigned to the Chicago district office.

Rene D. Wasserman has been elected to the executive committee of The Chief Executives Forum, Inc. Wasserman is chairman of the board of the Eutectic Welding Alloys Corp., Flushing, N. Y. At Eutectic **Edward Zacavich** has been named district manager for Hawaii.

O. M. Taylor has been named district manager in the Southeast for the Hard Surfacing Division of Alloy Rods Co., York, Pa. Taylor will headquarter in Birmingham.

Taylor

Ritter

Shelton L. Ritter has been appointed vice president and general manager of Gweco, Inc., New Orleans. Gweco has also appointed **Edward A. Mailhes** as store manager in charge of sales, store operation, repair and truck routing.

Donald Walker has been appointed market research manager and **Don Berlinguette** has been named advertising manager at Omark Industries, Inc., Portland, Ore. Also at Omark, **Ray Carlton** has been named manager of original equipment manufacturer sales, and **Everett Lillig** has been named manager of the manufacturing division.

Circle No. 195 on Welding Info-Aid Card

FROMMELT

SPA - FLA

WRAP - AROUND

SAFETY SHIELDS

- UL Approved
- Light Weight
- Portable
- Self-Standing

• Tough duck or Weld-Tex coated glass cloth over a flexible, welded wire insert gives SPA-FLA safety shields amazing versatility. They "wrap around" the job, yet roll up Compactly for carrying or storing. In seven stock sizes from 18" x 36" to 72" x 108"

WRITE FOR DETAILS

FROMMELT INDUSTRIES, INC.

Dubuque, Iowa

SAFETY ECONOMY

HI-AMP®

GROUND CLAMPS

- Spring cannot be knocked out.
- Spring adjustment screw for easy replacement or adjusting.
- Sturdily built for excessive abuse.
- Designed especially for all-around welders needs.

LENCO, INC.

Box 189, Jackson, Mo.

Circle No. 196 on Welding Info-Aid Card

Circle No. 197 on Welding Info-Aid Card

ANYWAY YOU LOOK AT IT, IT'S OXO

THE SAFEST REGULATOR MADE

FREE: Write for complete Catalog showing all Models.

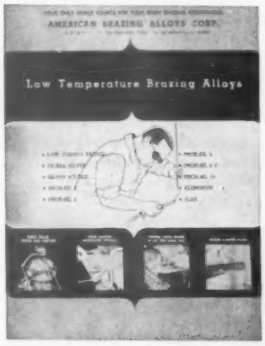
OXO

Welding Equipment Co.
Cedar and Oak Streets
New Lenox, Illinois

FOR ALL YOUR BRAZING ALLOYS...

Low Fuming Bronze, Aluminum, Nickel Silver, Silver Solder, Nickel Bronze, Silicon Bronze, Phosphor Copper and Silver, Aluminum Welding Wire

Request sample on company letterhead and send for this free catalog.



FOR NAME OF OUR NEAREST DISTRIBUTOR WRITE TO:

AMERICAN BRAZING ALLOYS CORP.
PELHAM, NEW YORK

Circle No. 198 on Welding Info-Aid Card

E. L. Mills, II, has been appointed assistant sales manager of the RegO Plant Equipment Div. of The Bastian-Blessing Co., Chicago. Mills will work under **J. K. Calhoun.**

The Carborundum Co., Niagara Falls, N. Y., has named **Robert W. Lear** vice president in charge of marketing.

Vincent P. Greeley has been named manager of the New England region of J. B. Nottingham & Co., Inc., New York City.

H. Donald Allman has been appointed manufacturing manager at the Warren, Ohio, plant of the Federal-Warco Div. of the McKay Machine Co.

DIED . . .

John C. Ardagh Jr., 31, a partner in Ardagh Welding Equipment Co., Chicago, died on July 6. Mr. Ardagh is survived by his widow and five children.

F. Lee Rodgers, 69, founder and senior partner of Rodgers Welding Supply, Buffalo, N.Y., died last month. Mr. Rodgers was associated with the Oxweld Railway Service of Linde Co. from 1919 till 1940. Mr. Rodgers was a life member of the American Welding Society.

Joseph F. Minnotte, 72, secretary-treasurer of Minnotte Bros. Co., Pittsburgh, died recently. A member of the American Welding Society, Mr. Minnotte was secretary of the Pittsburgh section for many years.

Charles P. Feebusch, 80, who retired two years ago as president of Gasflux Supply Co., died recently. Mr. Feebusch was formerly a consulting engineer for the Union Carbide Co. and The Bastian-Blessing Co. In World War II, he served as consultant to the war production board.

Harry M. Johnson, manager, secretary and partner in Wayne Welding Supply Co., Inc., Fort Wayne, Ind., died in Fort Wayne recently. Mr. Johnson became a partner in the firm in 1946.

"We're using M&T's new DC machine ...it's the best we've seen, and we looked..."

And if *you* look and compare, you'll concur. The Murex 3-phase DC Welder offers the type of rectifier that works best for this service; and it features a design that simplifies operation, makes life easy for the weldor.

Silicon diodes, hermetically sealed, are non-aging and give as much as 98% efficiency. Electrical circuit is designed for instant recovery voltage so that arcs are easily struck, stabilized, and maintained. Simple knob and selector make control of heat and polarity very easy.

Write for data sheet. METAL & THERMIT CORPORATION, General Offices, Rahway, New Jersey.

M-T MUREX DC WELDER

Circle No. 194 on Welding Info-Aid Card

"I hear the Muretran* welder can handle any type of welding... man, is it engineered!"

Word gets around fast. M&T's "Muretran" Welder is the most versatile ever developed for its field of application. Look at this array of features:

Suitable for manual, automatic, inert gas (MIG, TIG), and spot welding—with quick changeover from one to the other. Plug-in timers for gas pre-flow, post-flow, high frequency drop-out, spot arc. Patented, dual windings in saturable shunt transformer. Sealed non-aging silicon rectifiers for highest efficiency. Want to hear more about M&T's welders?

Write for data on AC-DC and AC units. METAL & THERMIT CORPORATION, General Offices, Rahway, New Jersey.

*Trademark

M&T MUREX

MURETRAN All-Purpose WELDER

Circle No. 194 on Welding Info-Aid Card

Book reviews...

Metal literature

ASM REVIEW OF METAL LITERATURE, 1960. Published by the American Society for Metals, Metals Park, Ohio. Vol. 17, June, 1961. Edited by Marjorie R. Hyslop, 1,342 pages. Price $25.

This volume contains 11,903 annotations of articles, technical papers, reports and documents appearing in engineering, scientific and industrial publications throughout the world during 1960.

The book is divided into 20 sections covering different areas of materials and process engineering and technology including addresses of publications as well as comprehensive subject and author indexes.

Back issues of Vol. I through 16, 1944-1959 are also available at $20 per copy.

Structural connections

DESIGN OF WELDED STRUCTURAL CONNECTIONS. By Omer W. Blodgett and Dr. John B. Scalzi. Published by The James F. Lincoln Arc Welding Foundation, Cleveland 17, Ohio, 92 pages. Price $1 (U.S.A.) $1.50 (elsewhere).

Double-wire-bound manual, covered with simulated leather, is illustrated with 124 drawings, photographs, tables and examples.

The manual gives a summary of fundamentals and best current practices to help reader design efficient welded connections for all types of structures once forces and movements are known. Manual is also a reference text for students of structural steel design.

Book covers arc welding process, steel weldability, distortion, erection, and inspection. It also covers connection design for buildings and bridges using elastic or plastic theories. Connection coverage includes weld classification, strength, size and procedure.

Circle No. 199 on Welding Info-Aid Card

product defects

getting you down?

let us help you...

- *find hidden cracks* with magnetic particle or dye penetrant inspection equipment
- *find deep-lying defects* with x-ray or gamma radiography equipment
- *see "innards" directly* with bright-image fluoroscopes
- *work out the method* at our Industrial Applications Lab

call any local Picker office where a technical expert is always near (see 'phone book) or write

Picker x-ray

1275 Mamaroneck Ave., White Plains, N.Y.

Magnetic Ground Clamp

On and Off in seconds . . . No awkward clamps, screws or springs needed to hold ground to work.

Rugged aluminum body makes for improved electrical contact; ground remains cooler, thus increasing efficiency of welder.

A great time-saver . . powerful, long-lasting built-in Alnico magnets produce a vise-like grip that holds the ground hog to work in any position . . . on flat, round or angular surfaces.

LIST EACH

600 AMP. $14.95

200 Amp. Rating ..... List $7.95

MAGNE CAST TOOL CO., Inc. • Distributor territories still open.

4614 WEST 5TH AVE. • CHICAGO 44, ILL.

Circle No. 200 on Welding Info-Aid Card

Circle No. 201on Welding Info-Aid Card

USE MIR-O-COL HARD FACING ELECTRODES FOR ECONOMY IN LABOR COSTS, MATERIAL, INCREASED SERVICE

In the fields of construction, mining, rock product industries, iron and steel manufacturing, petroleum and agriculture, MIR-O-COL electrodes are synonymous with strength.

- INCREASES EQUIPMENT LIFE
- FEWER REPLACEMENTS
- REJUVENATES WORN PARTS
- PERMITS USE OF LESS EXPENSIVE METALS
- SAVES MONEY, LABOR, TIME

CHECK THE MIR-O-COL M-700 SEMI-AUTOMATIC

open arc wire feed unit. Designed for application of specially fabricated alloy wire for hard facing hard working equipment.

Wire for complete information:

MIR-O-COL ALLOY CO., INC.
548 NO AVE 21 LOS ANGELES 31 CAL

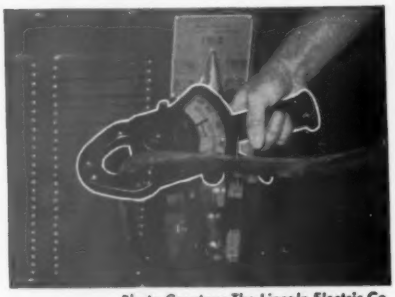


Photo Courtesy The Lincoln Electric Co.

now . . .
ONE AMMETER for AC/DC WELDERS
Only TONG-TEST measures both AC and DC

Weld with confidence. Use the exact amperage — no more, no less—to assure welding quality. Prevent costly rejects by controlling the welding current (AC or DC) with one TONG TEST AMMETER. Simply snap tongs around electrode cable — read amps instantly and accurately. No electrical connections required, cannot burn out. Interchangeable ranges up to 1000 amperes.

Write for Catalog WE-400

COLUMBIA ELECTRIC MFG. CO.
4551 Hamilton Avenue • Cleveland 14, Ohio

Circle No. 202 on Welding Info-Aid Card

Rocket motor cases

FABRICATION OF WELDED MOTOR ROCKET CASES. Published by the American Welding Society, Technical Dept., 33 W. 39th St., New York 18, N. Y., 72 pages. Price $2.50.

Book is a guide to the fabrication of welded rocket motor cases for the purpose of obtaining consistent quality and reliability.

The book covers materials, design, welding and quality assurance. Included in the materials section are detailed data on ultra high strength steels with yield strengths in excess of 200,000 psi.

The design section analyzes each type of joint, its advantages and limitations. The welding section contains recommendations for welds and tables on standards for acceptance for radiographic inspection, mechanical testing, visual inspection and other methods.

Auto welding design

RECOMMENDED PRACTICES FOR AUTOMOTIVE WELDING DESIGN. Published by the American Welding Society. Technical Dept., 33 W. 39th St., New York 18, N. Y., 48 pages. Price $2.50.

Manual contains many illustrations and a chart of AWS standard welding symbols.

Subjects covered in the book include: resistance welding, arc welding, oxyacetylene welding, braze welding, and torch brazing. A unique cartoon approach has been used to emphasize the need to design for the process specified.

Welded pipe design

WELDED PIPE DESIGN. Published by Steffan Mfg. Corp., P. O. Box 275, Salem Ohio. By Stephen A. Grubish, 36 pages. Price $2.

This booklet (a portion of which appeared in *Welding Engineer*, Oct., 1960, page 33) discusses principals of transmission pipe joint design in practical terms.

Flame cutting, beveling, constructing tees, lateral and mitre joints, inside and outside saddles, size on size, set-in and off center joints, and various other subjects pertaining to pipe joining are analyzed and illustrated diagrammatically with pen and ink sketches.

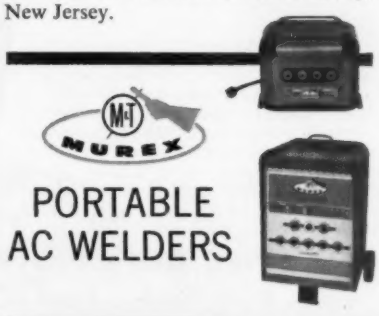
"For economy in light industrial or farm work M&T Portable AC Welders are our first choice."

If you're looking for a low-cost welder for shop and farm work, check the M&T line. You'll find just what you want.

For example, there's Model M 9T—a complete, portable welding outfit that welds up ¼" plate. It includes a 20-95 amp. transformer unit, two 6-ft. heavy duty cables, full-size helmet, electrode holder, ground clamp, starting carbon, sample electrodes.

For heavier work there's Model M 18T-1, a 180-amp. AC welder with 80v. open circuit voltage. You can use all types of electrodes with this ruggedly built unit that has many of the features of industrial welders. The price, however, is only a fraction of what you might expect to pay.

Write for data sheets. METAL & THERMIT CORPORATION, General Offices, Rahway, New Jersey.

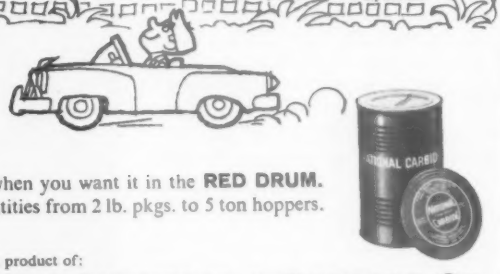


M&T MUREX
PORTABLE AC WELDERS

Circle No. 194 on Welding Info-Aid Card

For more facts Circle No. 203 on Welding Info-Aid Card

NATIONAL CARBIDE TOPS IN QUALITY!



All you want—when you want it in the **RED DRUM.**
All sizes, in quantities from 2 lb. pkgs. to 5 ton hoppers.

Calcium carbide is a product of:

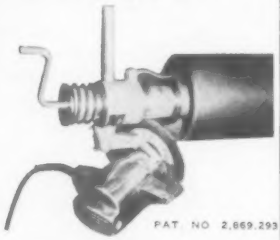
AIR REDUCTION CHEMICAL & CARBIDE CO.
A Division of Air Reduction Company, Incorporated
150 East 42nd St., New York 17, New York, MUrray Hill 2-6700 area code 212

H & M SPECIALIZED EQUIPMENT

makes fast work of difficult pipe cutting and beveling jobs.

OUT-OF-ROUND PAT. NO. 2,943,373
For egg-shaped pipe. Insures even, accurate cuts of irregular pipe. Roller rides pipe surface . . . makes cutting easy, simple. Fits All H & M Machines.

SHAPE CUTTER PAT. APPLIED FOR
For intersectional cutting. Accurately cuts saddles, tees, els and other irregular shapes. Lightweight and extremely portable. Fits all H & M Machines.



PAT. NO. 2,669,293

BEVEL-LAND GRINDER
Smooths pipe cuts and accurately places the lands on bevels in a matter of seconds. Eliminates costly handwork.

H & M's complete line of pipe cutting and beveling machines can save you money. Write for catalog sheets and price lists, TODAY!

PIPE BEVELING MACHINE COMPANY
311 E. Third St. TULSA 20, OKLAHOMA LUther 3-0241
T M Reg

In retrospect

(Taken from **Welding Engineer** issues of August, 1916, 1931 and 1946)

—45 Years Ago—

Railroad regulation must be taken out of politics. The confusing control exercised by 48 different states and the Interstate Commerce Commission must be eliminated, as it causes endless conflict, trouble and useless expense. — From an editorial entitled "The Railroad Situation."

The Union Carbide Co. is erecting in Saude, about 60 miles from Bergen, Norway, a plant for the manufacture of calcium carbide.

—30 Years Ago—

The Denver Oxygen Co., 901 Navajo St., Denver, started production in its new plant last month. President of the new company is S. R. Hord, and associated with him are C. C. Cabiness and J. H. Allison.

Announcement has been made that the new revisions of the Boiler Code allowing the use of fusion welding in the construction of pressure vessels and power boilers have been adopted and approved. The X-ray test requirement has been retained, but some opportunity has been left for substituting other non-destructive means of examination in the future.

—15 Years Ago—

Thomson Electric Welder Co., Lynn, Mass., is the new name of the former Thomson-Gibb Electric Welding Co.

R. M. Wilson, Jr., formerly with General Electric Co., Bloomfield, N. J., has joined the technical service section of the development and research division of International Nickel Co., Inc.

Airco Export Co., a subsidiary of Air Reduction Co., Inc., has opened a permanent products exhibit in connection with its main office at 33 W. 42nd St., New York City, to demonstrate its products to buyers and representatives from abroad.

For more facts Circle No. 204 on Welding Info-Aid Card

THE WELDING SHOPPER

UNDISPLAYED RATE

(Not available for equipment advertising) $1.10 a line, minimum 6 lines. To figure advance payment, count 5 average words as a line.

INDIVIDUAL EMPLOYMENT WANTED advertising rate is ½ the above rate; minimum $5, payable in advance.

INFORMATION

BOX NUMBERS count 1 line additional in undisplayed ads.

DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAY RATE

The advertising rate is $12.00 per inch for all advertising appearing on other than a contract basis. Maximum size of display ad is 4 col. in. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ in. vertically on one column, 3 columns — 30 inches — to a page.

HELP WANTED

Large corporation in midwest has opening for experienced welding engineer, preferably, but not absolutely essential, under 40 years of age. A thorough knowledge of metallurgy and its related subjects, as well as a working knowledge of all welding processes on both ferrous and nonferrous materials, circuitry, jigs and fixtures, is required. All replies will be kept in strict confidence. Write Box No. 814, c/o Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

Sales Representative to call on welding distributors in Eastern territory for manufacturer. Permanent position with growing company. Salary plus monthly bonus, expenses, profit sharing and pension. Write Box 815, c/o Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

Executive welding supply salesman to work in Santa Clara Valley with long established leading firm in San Jose and San Francisco Peninsula area. Distributors of the finest lines in our industry. Only men with proven sales record and experience need apply. Age 25 to 42 years. Salary, commission, expenses and fringe benefits. Give complete personal and business resume which will be held in strict confidence. Splendid opportunity with expanding organization. Send reply to Box 816, c/o Welding Engineer, 5826 Dempster St., Morton Grove, Ill.

EQUIPMENT FOR SALE

POSTIONERS, WELDERS & PLATENS

1-4600#-12" P&H WP-3; 2-6000# RANSOME Positioners. Bargain prices. 300 & 400 amp Lincoln 3 Ph Welders, late models; buy or rent. 14 Miller Gold Star SRH-333, 300 amp welders; buy or rent. 18 Welding Platens, 5x5, 3" depth, 6" skirt; 1½" holes on 3" centers. Used. No cracks. Excellent condition. Price until Oct. 1st, $250.00 ea. FOB Phila., Pa.

J. A. CUNNINGHAM EQUIPMENT INC.
2025 Trenton Avenue Philadelphia 25, Pa.

LOW FUMING BRONZE RODS

for Gas Welding & Brazing

Bare & Flux Coated

AUFHAUSER BROTHERS

Albertson, Long Island, New York

OXYGEN PLANT

40 meter, up to 1600 cu. ft. per hour Factory rebuilt column as new. Liquid pump new; guaranteed. $20,000 net f.o.b. Detroit. Total value with electrical equipment $45,000.

ACETOGEN GAS COMPANY
20137 Sherwood Ave. Detroit, Michigan

SCHOOL

WELDING TRAINING. Complete or brush up courses in oxy-acetylene welding & cutting, Manual Arc, TIG, Automatic, Pipe (up & downhill), sheet metal, etc. Precode test training. Request bulletin from — Hobart Welding School, Box U-812, Troy, Ohio.

MANUFACTURERS - CONTRACTORS. Eliminate high training costs. Hire all position combination weldors ready for certification. MODERNWELD TRAINING & PLACEMENT, 1740 Broadway, Schenectady, N. Y.

EQUIPMENT FOR SALE

AIRCO CUTTING MACHINE PARTS

Huge inventory of mechanical parts (no electrical) for Airco No. 10 and No. 4 Radiographs, No. 10 Planograph and No. 40 Travographs. Send for part lists.

RALL SUPPLY CO., 51 E. 42nd St., N.Y.C. 17

Model 50VB-62A AIRCO 500 amp. D.C. "Bumble-Bee" AIRCOMATIC WELDER, Primary 208V., 68 amps., 23KW, 24.6 KVA, 3 ph., 50/60 cy.; Secondary 35V, 500 amps. 100% Duty Cycle, with Airco Automatic Welding Head and Gun, Serial 7872.

Type PMCO2S-47A SCIAKY 70 KW PRESS TYPE SPOT WELDER, Weld Circuit 60/220; Auxilliary 60/220; Max. Press 1#/ in 29.6; 42" Throat, Pneumatic Foot Control, with Electric Contact Gauge, Sciaky Welding Controls, Series 2711.

INDUCTION HEATER

MODEL 4HL2A1 GENERAL ELECTRIC 5 KW HIGH FREQUENCY INDUCTION HEATER, 2 Position, Frequency 510-540 KC, Line Current 41/20.5 amps., with timer and controls, Power supply 3/60/230-460, Serial 7161.

24 Station Rotary Brazing Table with Selas Burners.

SERVICE WELDING COMPANY
685 Bergen Blvd. Ridgefield, N. J.

HELP WANTED

THE INTERNATIONAL NICKEL COMPANY, INC.

RESEARCH METALLURGISTS

Immediate positions for Research Metallurgists at INCO's research laboratory. Applicants should possess the training and ability to do welding research on newly developed ferrous and non-ferrous alloys.

Excellent opportunities for publication. Candidates should have an advanced degree in metallurgy and several years of research experience.

Direct brief resume to: DIRECTOR OF RESEARCH

THE INTERNATIONAL NICKEL COMPANY, INC.
71 Wall Street New York City 5, N. Y.

All qualified applicants will be considered without regard to race, creed, color or national origin.

INCO
TRADE MARK

To get your free copies, circle the appropriate number on Welding Info-Aid card. ➳

LITERATURE for your library

HARDFACING DEPOSITS — Wall Colmonoy Corp. Technical Data Sheet No. T-2 gives specific grinding wheel recommendations for nickel base, cobalt base and iron base hardfacing alloy deposits.
Circle No. 76 on Info-Aid Card.

METALS PRODUCTION — Ampco Metal, Inc. Full-color illustrated booklet (G60) is a 16-page report on the history, research, facilities and distribution of firm's metal products including a chart of the physical properties and general applications of various metals.
Circle No. 77 on Info-Aid Card.

SEAMLESS GAS CYLINDERS — Harrisburg Steel Co. Three-color 28-page Catalog No. 58 gives complete illustrated information on various seamless high-pressure gas cylinders.
Circle No. 78 on Info-Aid Card.

ELECTRODE SELECTION — Marquette Mfg. Co. Fifty-page illustrated booklet (Form No. 8450) with compiete specifications and information on a wide variety of electrodes also contains electrode comparison chart.
Circle No. 79 on Info-Aid Card.

ROLL REBUILDER — Automatic Welding Co. Bulletin MI-402 contains data on an automatic unit for hardfacing tractor, crane or shovel rollers, idlers and wheels.
Circle No. 80 on Info-Aid Card.

ARC WELDING — Hobart Bros. Co. "Hobart Arc Welding News" No. 166 is a 24-page booklet of photographs and articles on arc welding all over the country.
Circle No. 81 on Info-Aid Card.

HARDFACING WIRES, ELECTRODES — Air Reduction Sales Co. Form ADC 955 is a 44-page brochure with cross-referenced pictorial layout in which all hardfacing materials are classified and illustrated according to use.
Circle No. 82 on Info-Aid Card.

METALLIZING — Metco, Inc. Six-page illustrated Bulletin 15 10/M uses case histories to show how to save money and cut downtime with metallizing.
Circle No. 83 on Info-Aid Card.

SAFETY HAT — American Optical Co. Safety hat and its accessories are illustrated and described in this 8-page 2-color booklet (S-1465).
Circle No. 84 on Info-Aid Card.

WELDING AUTOMATION — Acro Welder Mfg. Co. Heavily-illustrated Bulletin No. 261, 16 pages, describes many automatic welders for resistance and arc welding.
Circle No. 85 on Info-Aid Card.

DIP BRAZING — Precision Dipbraze, Inc. Brochure (PD12) is illustrated 8-page guide to dip brazing including procedures and advantages.
Circle No. 86 on Info-Aid Card.

NONDESTRUCTIVE TESTING — Balteau Electric Corp. Booklet provides a comprehensive list of popular nondestructive testing methods and applications best suited to each.
Circle No. 87 on Info-Aid Card.

HARDFACING ELECTRODES — Rankin Mfg. Co. Full-color Form B-6 presents detailed information on hardfacing electrodes and their uses.
Circle No. 88 on Info-Aid Card.

UNIQUE APPLICATIONS — Metal & Thermit Corp. Sixteen-page booklet lists and illustrates a dozen unique applications of firm's electrodes all over the world.
Circle No. 89 on Info-Aid Card.

CYLINDER POSITIONER — Hanna Engineering Works. Catalog 500A is three-color illustrated guide to unit for positioning air and hydraulic cylinders at pre-set points.
Circle No. 90 on Info-Aid Card.

MULTI-ARC WELDING — J. B. Nottingham & Co., Inc. Advantages of welding with many arcs from one power source are discussed in this 4-page two-color illustrated form (BL MA101).
Circle No. 91 on Info-Aid Card.

VACUUM SYSTEMS — Vac-U-Max. Two-color illustrated folder (No. 100-B) describes air-operated vacuum equipment for handling disposable or reusable materials. Specifications of units are included.
Circle No. 92 on Info-Aid Card.

MANGANESE RODS, WELDMENTS — American Manganese Steel Div. Three-color illustrated Form No. MN-60 tells how to choose and use manganese electrodes and weldments.
Circle No. 93 on Info-Aid Card.

ISOTOPE CHAMBERS — Philips Electronics Instruments. Six-page Norelco folder gives engineering data on 19 isotope chambers for gamma radiography. Text discusses radiography procedures, features, operation and construction.
Circle No. 94 on Info-Aid Card.

STEEL BRIDGES — American Institute of Steel Construction, Inc. Eight-page booklet tells 15 ways to reduce the cost of short span steel bridges.
Circle No. 95 on Info-Aid Card.

ALUMINUM, COPPER, BRASS — The PMI Corp. Form 3547 is 22-page price list of aluminum, copper and brass in rod, wire, sheets, circles, coil and strip.
Circle No. 96 on Info-Aid Card.

SAFETY CLAMPS — J. C. Renfroe & Sons, Inc. Thirty-page illustrated booklet presents full information on line of safety clamps including price list.
Circle No. 97 on Info-Aid Card.

TIG WELDING — Air Products, Inc. Sixteen-page illustrated booklet VA-60 explains Tig welding and lists various Tig welding equipment with specifications of each.
Circle No. 98 on Info-Aid Card.

TRACK REBUILDING — Victor Equipment Co. Two-color 16-page catalog describes equipment for rebuilding track-type track assemblies.
Circle No. 99 on Info-Aid Card.

WELDING STEEL — The McKay Co. Twenty-page catalog contains information on electrodes for welding mild and low alloy steels. Sections on problems, terminology and charts are included.
Circle No. 100 on Info-Aid Card.

BACKING RINGS — Robvon Backing Ring Co. Illustrated sheet describes Type CC backing rings for alignment of pipe where inside diameters are slightly out of round.
Circle No. 101 on Info-Aid Card.

DYE PENETRANT INSPECTION — Magnaflux Corp. Form No. 16,678 is illustrated color form in four pages explaining the uses and advantages of spray-on dye penetrant inspection.
Circle No. 102 on Info-Aid Card.

Make a habit of folding out the INFO-AID cards as you begin to read each issue of WELDING ENGINEER so that you can easily circle the appropriate numbers.

WELDING info-aids

To receive literature, catalogs and bulletins described on this page, and the preceding and following pages; for more information on products or services advertised in this issue; and for more information about

NEW PRODUCTS on pages 22-31

USE THESE HANDY FOLD-OUT CARDS (post paid) ⟶

PLEASE: **Fill out all lines on card. Illegible or incomplete addresses may keep you from receiving the information you desire.**

INFO-AID card is valid for only three (3) months. After that, write directly to the manufacturer, describing fully the information and/or literature wanted.

Advertisers' Literature

Literature offered in advertisements which were received up to the 5th of last month. To get the literature you want circle numbers on fold-out card at right.

182. Air Reduction Sales Co. — Catalog available, "Airco Hardfacing Electrodes and Wire" recommends the electrode or wire to use in 105 hardfacing applications and gives characteristics of each.

186. All-State Welding Alloys Co., Inc. — Folder on "Jet Flux" and Instruction Manual and Catalog are available on All-State rods and fluxes for all brazing methods.

198. American Brazing Alloys Corp.— "Low Temperature Brazing Alloys" catalog available and name of your nearest distributor.

181. Anti-Borax Compound Co., Inc.— Descriptive circular and sample of "Anti-Borax" brazing flux is available.

175. Aronson Machine Co., Inc. — Detailed engineering data available on Aronson positioners.

179. Auto Crane Co. — Write for illustrated literature, specifications and price lists on all models of Auto Crane.

172. Auto-View Welding Helmet Co.— Write for literature on Auto-View welding helmets.

168. The Bastian-Blessing Co. — Catalog No. G300-GA available on "RegO" acetylene cylinder valves.

Name

Title

Company

Address

City Zone State

WELDING ENGINEER AUGUST, 1961

Card not good after November 1, 1961

Please send me more information about:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109	110	111	112
113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182
183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238
239	240	241	242	243	244	245	246	247	248	249	250		

Name

Title

Company

Address

City Zone State

WELDING ENGINEER AUGUST, 1961

Card not good after November 1, 1961

Please send me more information about:

1	2	3	4	5	6	7	8	9	10	11	12	13	14
15	16	17	18	19	20	21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36	37	38	39	40	41	42
43	44	45	46	47	48	49	50	51	52	53	54	55	56
57	58	59	60	61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80	81	82	83	84
85	86	87	88	89	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109	110	111	112
113	114	115	116	117	118	119	120	121	122	123	124	125	126
127	128	129	130	131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150	151	152	153	154
155	156	157	158	159	160	161	162	163	164	165	166	167	168
169	170	171	172	173	174	175	176	177	178	179	180	181	182
183	184	185	186	187	188	189	190	191	192	193	194	195	196
197	198	199	200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221	222	223	224
225	226	227	228	229	230	231	232	233	234	235	236	237	238
239	240	241	242	243	244	245	246	247	248	249	250		

Postage Will Be Paid by Addressee

BUSINESS REPLY CARD
First Class Permit No. 22, Morton Grove, Ill.

Welding Info-Aids
Welding Engineer
P. O. Box 28
Morton Grove, Ill.

No Postage Stamp Necessary If Mailed in the United States

Postage Will Be Paid by Addressee

BUSINESS REPLY CARD
First Class Permit No. 22, Morton Grove, Ill.

Welding Info-Aids
Welding Engineer
P. O. Box 28
Morton Grove, Ill.

No Postage Stamp Necessary If Mailed in the United States

ADVERTISERS IN THIS ISSUE

This advertisers' index is included as a convenience and is i way a part of the advertising contract. Although every care been taken to index accurately, some errors may have occurred no allowance will be made for them.

A

Air Products Inc. 14
Air Reduction Chemical & Carbide Co. 28, 72
Air Reduction Sales Co. 57, 67
All-State Welding Alloys Co. 61
American Brazing Alloys Co. 69
American Chain & Cable Co., Inc., Page Steel & Wire Div. ..... Inside Front Cover
American Optical Co. 17
Anti-Borax Compound Co., Inc. 56
The Arcair Co. 30
Arcos Corp. 24, 25
Aronson Machine Co. 45
Auto Crane Co. 55
Auto View Welding Helmet Co. 31

B

Bastian Blessing Co. 29
Bay State Abrasive Products Co. 10
Belden Mfg. Co. 15
Bernard Welding Equipment Co. 5
Bestos Glove Co. 30

C

Chemetron Corp., National Cylinder Gas Div. 18
Columbia Electric Mfg. Co. 71
Contour Sales Corp. 60
Coyne Cylinder Co., Div. of American Cryogenics, Inc. 31
Crose Perrault Equipment Corp. 65

D

Dockson Corp. 58
Duro Engineering Co. 64

E

Eisler Engineering Co. 67

F

Frommelt Industries 68

H

H&M Pipe Beveling Machine Co. 72
Harnischfeger Corp. 34
Harrisburg Steel Co. 59
Hobart Brothers Co. 1, 2

I

Industrial Instruments Inc. 56
International Nickel Co. 73
Invincible Vacuum Cleaner Mfg. Co. 20

J

Jackson Products, Div. of Air Reduction Co., Inc. ...

L

Lenco, Inc. ...
Lincoln Electric Co. ...
Linde Co., Div. of Union Carbide Corp. 26, 2

M

Magne Cast Tool Co., Inc. ...
Markal Co. ...
Metal & Thermit Corp. 68, 69, 7
Metalloy Products Co. ...
Metco Inc. ...
Mid-States Welder Mfg. C
Miller Electric Mfg. Co. ..... 32, Back
Mir-O-Col Alloy Co., Inc. ...

N

National Cylinder Gas, Div. of Chemetron Corp

O

Oxo Welding Equipment C

P

Page Steel & Wire Div., American Chain & Cabl Co., Inc. ..... Inside Front
Phelps Dodge Copper Products Corp. ...
Picker X-Ray Corp. ...
Pressed Steel Tank Co. ...

R

Robvon Backing Ring Co.

S

Servospeed Division, Electro Devices, Inc. ...
Skinner-Horton Chuck Div Skinner Precision Industries, Inc. ...

T

Tempil Corp. ...
Tweco Products, Inc. ..... Inside Back

U

United States Steel Corp.

V

Victor Equipment Co. ...

W

Wallace Supplies Mfg. C
Webb Corp., The ...

SUE

nd is in no
ry care has
ccurred and

v. of
Inc. 9

68
51-54
ion
26, 27, 47

., Inc. 70
28
3, 69, 70, 71
o. 30
19
Mfg. Co. 23

, Back Cover
, Inc. 71

Gas,
n Corp. 18

ment Co. 69

Div.,
& Cable
e Front Cover
er
49
70
Co. 4

ng Co. 63

,
Inc. 27
ck Div.

16

21

e Back Cover

Corp. 13

Co. 6

Mfg. Co. 62
66

154. Bernard Welding Equipment Co. — Send for Bulletin 102 further explaining the Bernard Connectors.

202. Columbia Electric Mfg. Co. — Catalog WE-400 is available on the Tong-Test Ammeter to get the exact amperage for your welding job.

152. Hobart Brothers Co. — Catalog available on all types of welding electrodes manufactured by Hobart.

180. Industrial Instruments Inc.—Write for complete technical details on locating leaks in tanks piping and other fittings with the helium leak detector.

162. Invincible Vacuum Cleaner Mfg. Co. — "Flux Recovery Equipment Folder" available.

167. Markal Co. — Literature on "Thermomelt" available and sample pellets.

194. Metal & Thermit Corp. — Data sheets available on the M & T portable AC Welder.

161. Metco Inc. — Additional information on hardfacing by flame spraying is available in a booklet, "Thermo-Spray."

174. Miller Electric Mfg. Co. — Pamphlet available, "Rectifiers for Welding" and descriptive literature on the Miller Gold Star SR or SRH welders.

197. Oxo Welding Equipment Co. — Complete catalog showing all models of regulators manufactured by Oxo, is available.

150. Page Steel and Wire Div. — Folders DH-402 and DH-1218 are available on the Page line of welding wire.

153. Pressed Steel Tank Company — Cylinder catalog available, "Hackney Compressed Gas Cylinders" describes and illustrates the wide variety of "Hackney" cylinders.

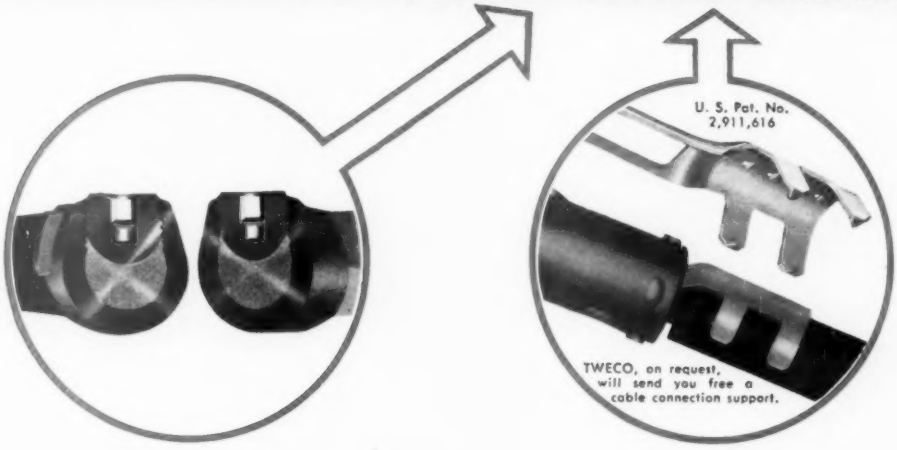
WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards postmarked after the deadline date cannot be processed.

★Post card not valid after three (3) months. After that, write *directly to the manufacturer*, describing fully the information and/or literature wanted.

*With TWECO, YOU'RE ON THE BALL

TWECOTONG HOLDERS *Hold rods tight. They run cool — Tough laminated insulation does not break — Well balanced — Fits the palm of the hand — Attach to cable in 2 minutes — 7 models of TWECOTONG — A size for every job.*



TWECOTONG'S BALL-POINT CONNECTION exerts high pressure on every cable strand guaranteeing 100% electrical and thermal conductivity for cool running and long life. Bare the cable end 1", insert in Ball-Point Connection socket, then tighten Ball-Point screw with strong 7/32" hexagon wrench. Do it in less than 2 minutes — EASY.

USE TWECO'S CABLE CONNECTION SUPPORT to stop fraying and breaking of cable strands right behind the holder connection. Eliminates cable strand movement and jacket slip-back at this critical place where cable strand failure has always happened. No. 10-P fits any model TWECOTONG holder and any size cable.

Tweco PRODUCTS, INC.

MANUFACTURERS: ARC WELDING ELECTRODE HOLDERS, GROUND CLAMPS, CABLE CONNECTORS, TWECO-LITE ALUMINUM WELDING CABLE

P. O. BOX 666 • Factory: Boston at Mosley • Phone AMherst 3-1684 • Wichita 1, Kansas

*HIGH PRESSURE TWECO Ball-Point Cable Connection is now available on all Twecotong Electrode Holders, TWECO Ground Clamps, Cable Connectors, Cable Splicer, Cable Lugs. Tell your welding supply distributor you want TWECO.

For more facts Circle No. 205 on Welding Info-Aid Card

For more facts Circle No. 206 on Welding Info-Aid Card →

Miller Gold Star SR welders excel in all the basic virtues of maximum arc stability, more metal deposition, wide range, ease in arc starting, denser welds and quiet operation. But they go well beyond these widely-recognized SR characteristics to bring industry such welcome refinements, for instance, as an electrical control with exclusive Miller-built transformer, easy addition of sequence timers for automatic processes and the phenomenal Miller "never-fail" rectifier.

The list of features, applications, sizes and "exclusives" embodied in the Miller SR welders should be in the file of everyone planning on making a better product or a profit with welding. A request for additional information on the Gold Star SR line will be sent promptly upon request.

miller ELECTRIC MANUFACTURING COMPANY

APPLETON • WISCONSIN